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From local modification to global innovation: How research units in emerging economies innovate for the world

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Abstract

More and more companies are turning to emerging markets as sources of global innovation to help transform business and society. However, building innovation capabilities in emerging markets is still elusive for most companies. To understand how some companies are successfully building these capabilities, we examined workers within R&D units in China across six foreign multinational corporations. In contrast with prior literature that emphasizes a structural view of *who* the workers interacted with to innovate, our inductive analysis highlights a behavioral view of *how* R&D unit personnel interact during the problem and solution search process. We identified two key behaviors associated with the problem and solution search: (1) observing customers in their everyday context, and (2) uncovering general knowledge principles from internal experts. Respectively, these behaviors helped R&D workers to question assumptions about existing products as they relate to customers and to apply useful principles from expert knowledge rather than copying solution templates. Our findings offer an alternative path to building global innovation capabilities in markets where structural constraints exist for the company.

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INTRODUCTION

Emerging economies are often seen as locations for product modification by multinational corporations (MNCs) – where products and services from developed markets are adapted to lower costs and meet local market needs (Luo, Sun, & Wang, 2011; Peng, Ahlstrom, Carraher, & Shi, 2017; Shenkar, 2010). While many companies have succeeded by selling globally standardized products and services to emerging economies, they are facing increasing pressures to innovate in, rather than modifying for, these markets (Awate, Larsen & Mudambi, 2015; Cantwell & Mudambi,

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2005, 2011; Govindarajan & Ramamurti, 2011; Mudambi & Swift, 2014; Qiu & Cantwell, 2018). For example, companies like Apple and Amazon have turned to emerging economies like Indonesia and Israel to build innovation capabilities to come up with unique solutions to some of the global problems their developed market peers have not been able to solve (The Economist, 2022). Such efforts at global innovation (i.e., solving problems in local markets to develop novel solutions for the entire MNC) feature prominently in R&D operations scattered across the developing world (Roth, Song, & Woetzel, 2015; Si, 2019).

According to knowledge-based views of the firm, building innovation capabilities comes from following a two-stage process of (1) *problem search* by interacting with lead customers, and (2) *solution search* by reaching outside the firm to external experts (Liu, Lu, Filatotchev, Buck, & Wright, 2010; Lorenzen, Mudambi, & Schotter, 2020). Problem search represents the first phase in the capability-development process in which the R&D team seeks to understand the problems faced by customers. Solution search represents the second phase of the process in which the team seeks solutions to the identified problem (Nickerson & Zenger, 2004). Yet, despite efforts to build global innovation capabilities in emerging economies, foreign MNCs have traditionally struggled in leveraging their R&D efforts for global innovation because these markets are often bereft of lead customers and local R&D teams often lack access to global innovation centers with external experts (Papanastassiou, Pearce, & Zanfei, 2020). Though challenging to do, overcoming the lack of access to lead customers and global experts to innovation represents a vast potential for MNCs to provide solutions for many of the global challenges facing business and society.

The purpose of this paper is to examine how MNCs develop global innovation capabilities in their emerging economies' R&D teams. We start by identifying how the two-stage (problem and solution search) innovation process applies to global innovation in emerging economies. A lack of knowledge persists because previous research drawing upon knowledge-based views has primarily taken a structural view of problem and solution search (Albert & Siggelkow, 2022; Argote, Aven, & Kush, 2018; Murthy & Madhok, 2021; Zhong, Makhija & Morris, 2022). This structural view focuses on *who* the R&D teams interact with but fails to capture behavioral differences in *how* teams interact with customers and experts to innovate. Accordingly, we used an inductive, theory-building approach and exploited rich qualitative data from six foreign R&D units in China to determine how problem and solution search behaviors lead to global innovation outcomes.

We find that the key factor to global innovation is not *who* R&D teams interact with during the problem and solution search processes (a structural view) but rather *how* they interact with customers and experts during these processes (a behavioral view). In the problem-search process, R&D teams engaged in global innovation participated in what we call *contextual observation* of customers, questioning existing assumptions about the core features of the products. Traditionally, such behavior has been associated exclusively with interactions with lead users (von Hippel, 1986). Interestingly, we find that even when R&D teams could not interact with lead users, they were still able to generate global innovations by contextually observing local customers.

We observed a similar pattern in the solution search process. We found that teams oriented toward global innovation actively worked with experts to uncover principles (i.e., underlying theories or cause–effect relationships) about the new knowledge they accessed. Traditionally, deep cause–effect understanding was obtained by engaging with outside experts located in innovation hubs (Berry, 2014; Morris, Zhong, & Makhija, 2015). However, we observed that R&D units that actively uncovered principles were able to drive global innovation, regardless of whether they accessed solutions from internal resources or far-flung internal experts.

In sum, we demonstrate that constraints on the traditional path to global innovation (i.e., lack of access to lead users or global experts) may be overcome through alternative behavioral mechanisms (i.e., contextual observation and principles-based learning). These findings compel us to reconsider some of our fundamental assumptions about knowledge-based views of the firm and the process underpinning innovation capabilities in a global market (Hernandez & Guillén, 2018). First, rather than taking a corporate-level approach to innovation, we point out the need to identify individual behaviors teams need to engage in to be more innovative (Foss & Pedersen, 2019; Kogut & Zander, 1993). Second, we reconsider the traditional strategic approach of identifying knowledge objectives and then engaging in knowledge search. We do this by examining the behaviors involved in

the innovation process of how teams search for customer problems and then search for ways to solve them. This behavioral view is important, as corporations cannot specify a priori to their MNC units the knowledge they wish to obtain because this knowledge does not yet exist within the firm (Nickerson, Silverman, & Zenger, 2007). Such behavioral paths to innovation are not only relevant in emerging economies but also in peripheral regions of developed economies.

A MODEL OF INNOVATION

How do R&D units in an emerging economy innovate for a global market? Knowledge-based theory has tried to broadly answer this question by examining (1) how organizations search for problems and (2) how they search for solutions to those problems (Caner, Cohen, & Pil, 2017; Nickerson & Zenger, 2004). This approach tends to focus on differences in the quality of structural networks in which personnel are embedded (Grant & Phene, 2021; Kogut & Zander, 1993; Minbaeva, 2007). For instance, R&D units with access to customers who possess specific types of tacit knowledge can identify opportunities for innovations (Eisenhardt & Santos, 2002). Within this broader view of the firm, a dominant stream of literature has found that innovation is best achieved through access to multiple channels of knowledge outside of the firm to identify problems and find solutions leading to global innovation (e.g., Funk, 2014; Laursen, Masciarelli, & Prencipe, 2012; Saxenian, 2007).

In the first stage of the global innovation process, personnel learn from lead customers, discovering their unmet needs (Schweisfurth, 2017; von Hippel, 1986). Urban and von Hippel (1998: 569) defined lead customers as those who "face needs that will be general in a marketplace" before they are generally experienced and those who push the boundaries of existing products. These lead users know and can articulate potential problems and opportunities long before they are commonly known in the industry. Access, or more specifically, the lack of access to lead users, is especially important in the context of emerging economies. Because lead users are predominantly located outside of emerging economies, innovation likely flows from global R&D centers to local R&D units.

In the second stage of the global innovation process, R&D personnel engage in solution search by tapping outside expert networks (often across borders and even industries) to find novel solutions to the discovered problem (Cuypers, Ertug, Cantwell, Zaheer, & Kilduff, 2020; Edris & Cantwell, 2020; Peng & Luo, 2000). Thus, the common approach to global innovation is one in which developed-market R&D personnel interact with lead customers during the problem search phase and with external experts during the solution search phase, resulting in novel knowledge recombinations that drive global innovation. In this respect, structural connections to lead customers and solution experts are particularly valuable because they are key to generating innovative solutions to relevant problems (Corredoira & McDermott, 2014; Moran & Ghoshal, 1999).

Emerging economies, in contrast, traditionally lack lead customers, and local R&D teams have limited access to external experts (Awate et al., 2015; Berry, Guillén, & Zhou, 2010; Cantwell & Mudambi, 2005; Cantwell & Zhang, 2013; Kostova & Roth, 2002). From a product-life-cycle perspective, lead customers and external experts tend to be found primarily in developed markets, as these markets possess customers with more sophisticated product demands (Vernon, 1979). Moreover, accessing knowledge from lead customers and external experts in foreign markets presents significant knowledge access, transfer, and integration barriers due to cultural and geographic distance (Morris et al., 2015).

To help overcome their structural network constraints, emerging economies' R&D teams tend to rely on proximate customers to identify problems and then reach out to internal partners located in developed economies, who have much deeper R&D capabilities (McDermott, Corredoira, & Kruse, 2009; Pietrobelli & Rabellotti, 2011; Pietrobelli, Rabellotti, & Aquilina, 2004; Schotter, Mudambi, Doz, & Gaur, 2017). Proximate customers represent less sophisticated customers who tend to use the product as is and do little to push the demands of a product market. Such proximate customers are highly prevalent in emerging economies and are likely to represent the majority of customer interactions in these locations. Likewise, internal experts often represent team members from MNC headquarters or other developed-market units and tend to be the go-to source of solution search for R&D teams from emerging economies (McDermott & Pietrobelli, 2017). While such network structures can help R&D units in emerging economies with product upgrades, the upgrades are typically focused on adapting existing products to a more dynamic and cost-conscious local market than on

the global innovations found in developed economies (Cantwell & Mudambi, 2005; Kramer, Marinelli, Iammarino, & Diez, 2011).

With these structural constraints prevalent, it remains unclear how companies in emerging economies might evolve from local modification activities that are generally perceived to be competence-*enhancing* adaptations of existing products (Breznitz & Murphree, 2011; Shenkar, 2010; Tang, Murphree, & Breznitz, 2016) to more competence-*creating* global innovation, particularly in the absence of lead users and global experts. To better understand this process, we examine specific behavioral and structural differences between global innovation and local modification among MNCs' R&D units in an emerging economy. By incorporating a behavioral perspective, we follow advice from Foss and Pedersen (2019), who point out that a behavioral perspective might help understand "how" innovation capabilities are developed. Adopting a behavioral perspective also builds upon calls from other knowledge-based scholars to understand not only structures but also behaviors underlying knowledge coordination capabilities as a primary source of competitive advantage (Andersson, Buckley, & Dellestrand, 2015; Foss & Pedersen, 2019; Monteiro, 2015; Meyer, Li, & Schotter, 2020; Murphree, Petersen, Warrian, and Gosine, 2022).

METHODOLOGY

Our research setting is MNCs' R&D units operating in China. Traditionally, the focus in most R&D units in China, as with other emerging economies, has been on adapting global products for the local market. For instance, MNCs pass their existing products to the local R&D unit to adapt them to fit the needs or requirements of local customers. This focus on local modification is, in part, because of a historical pursuit of legitimacy or access (Li, Stoian, & Azar, 2018; Stevens, Xie, & Peng, 2016) and a lack of local innovation networks (Elango & Pattnaik, 2007; Genin, Tan, & Song, 2021; Li & Fleury, 2020; Parente, Melo, Andrews, Kumaraswamy, & Vasconcelos, 2021; Peng & Heath, 1996). However, MNCs with R&D units in China are increasingly shifting these units away from local modification centers toward global innovation sources (Peng, Lebedev, Vlas, Wang, & Shay, 2018). For example, Herrigel (2015) found that because of China's large and competitive market, the Chinese R&D units of many German auto companies are providing valuable competence-enhancing innovations for the entire MNC. While scholars have recognized that some innovation is taking place in China, we still have much to learn about global innovation from a behavioral process perspective (Govindarajan & Euchner, 2012).

In response, we rely on an inductive, multiple case-study approach to generate novel theory (Cohen, Bingham, & Hallen, 2019; Eisenhardt & Graebner, 2007). An inductive approach is appropriate because efforts in emerging economies' R&D global innovation are poorly understood but have the potential to make important contributions to theory. Employing a logic of multiple case studies allows us to contrast problem and solution search processes that enable local modification or global innovation. The multiple case-study approach also enables a replication logic, through clustering, that is more likely to generate parsimonious theory development in such cases (Cohen et al., 2019; Yin, 2009). Our research design allowed us to identify and understand variance by comparing structures and behaviors along the R&D units' innovation processes.

Sample

Our sample included six foreign MNC R&D units in China. The MNCs were headquartered in five countries: the United States, Germany, Switzerland, Netherlands, and Sweden (see Table 1 for our sample description). With country R&D units as the level of analysis, we followed similar inductive multiple case studies (Bremner, Eisenhardt, & Hannah, 2017; Davis & Eisenhardt, 2011) and ensured all sampled R&D units had certain theoretically relevant antecedents (Miles, Huberman, & Saldaña, 2013). We did this by ensuring that all sampled R&D units operated semi-autonomously and were not merely an outsourced part of a globalized R&D organization executing only local modification but that they had aspirations to engage in global innovation.[1] Thus, the sampled R&D units had a mandate to engage in global innovation yet had primarily engaged in local modification in the past. Given the R&D units' shared goal of innovation, we use the term *successful innovation* throughout the paper to mean actually launching a new (rather than locally modified) innovation for the global market, regardless of the commercial outcome, which we cannot systematically observe.

Table 1 Sample description

Pseudonym	HQ nationality	Customer	Interviews	Operations in China	Global employees
Swallow	German	B2B	6	1 corporate HQ	About 80,000
Hawk	USA	B2C	9	5 offices	Over 100,000
Magpie	Swiss	B2B	5	2 R&D/manufacturing centers 20 offices	About 15,000
Finch	Dutch	B2B	6	6 R&D units 3 factories	About 30,000
Albatross	Swedish	B2B	9	1 corporate HQ 30 offices	About 50,000
Sparrow	USA	B2B	4	1 subsidiary	1000+

Data Sources and Collection

We collected data from retrospective and real-time sources (Eisenhardt & Graebner, 2007; Yin, 2009), including semistructured interviews, e-mail correspondence for clarification and updates, site visits, and archival data from company websites. We used the archival data to supplement and improve the reliability of our results (Yin, 2009). Site visits enhanced internal validity by offering insight into the behaviors of personnel within the MNC R&D units.

The primary source of data for this study was semistructured interviews with R&D personnel and R&D project managers in 25 R&D projects embedded in two US and four European MNCs in China. Our objective was to dive deep into the efforts of diverse R&D teams, examine their behaviors, generate patterns of behavior, and correlate these with innovation outcomes at the R&D unit level. Given the nature of our research design, we were not testing but discovering patterns. We conducted 39 interviews lasting between 45 and 120 min each. All interviews were conducted with the same translator present (but not always used). A member of the author team who was fluent in Mandarin and English was also always present. Three of the authors recorded, transcribed, and analyzed the interviews. During the interviews, we took several precautions to reduce recall bias. First, we used polar sampling (Elsbach & Kramer, 2003) and asked the head of R&D to select R&D personnel from projects that were deemed more innovative and less innovative. This process helped us avoid the problem of success bias from the head of R&D, who was likely to nominate only R&D teams involved in innovative projects.

To encourage greater disclosure of information, we assured the interviewees that shared information would be kept anonymous. Anonymity helped reassure heads of R&D that there was no incentive to select R&D personnel who would reflect well on them or the company. We also informed them that the purpose of the study was not to assess performance (outcomes) but to understand the processes by which their R&D unit sought to identify and solve customer problems. The types of R&D projects undertaken by R&D units in China tended to be more "demand pulled" than "science and technology pushed" (Pavitt, 1984). In other words, while some of the innovations in these settings stemmed from basic science innovations that are then pushed onto customers, most of the innovations originated from customer observation or request. Within such R&D projects, an important innovative input came from interaction with customers (Bogliacino & Pianta, 2010). As a result, customers were the starting point for understanding the local modification or global innovation processes within the context of our research.

We followed structured, directed-style questioning methods: we directed informants to walk through a recently completed R&D project irrespective of its outcome, beginning with the identification of the customer need. Next, we asked what happened during the initial project idea, from basic research to product development, and continued asking questions about the process up until the end of the project. Focusing on a chronological approach to recent events reduced informant recall bias. We focused on facts, such as the practices that the R&D team members used, rather than opinion. We took several other steps to further reduce recall bias. We triangulated information provided by team members with the information provided by other team members and team managers, supplemented interview data with information on company websites and in the press, and asked the head of R&D about the success of projects at the end. We continued conducting interviews until responses no longer added novel insights (Glaser & Strauss, 1967).

Data Analysis

After collecting the data, we determined whether each project described resulted in global innovation or a local modification. As is common in the literature, we defined local modifications as those that focused on making incremental modifications to existing global products to tailor these products for the local market (Shenkar, 2010). We defined global innovations as those in which the R&D teams were actively driving the development of a novel product not found in the MNC or in which the process significantly changed either the components or architecture of an existing product and relied on developing new capabilities. In total, we classified 18 projects as local modifications and seven as new global innovations. Table 2 displays how many global innovations and local modifications were produced by each R&D team. The table also previews how we classified the innovation patterns of each R&D team – following the known path to global innovation previously identified in the literature, the known path to local modification, or an alternative behavioral path to global innovation that is the contribution of our paper. We describe these classifications in-depth in our analysis that follows.

We developed case histories for each R&D project and then compared each case against the others to confirm or revise our emergent theory (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). We used NVivo 11 to code each interview transcript. In building a map of the process, we coded each case by looking at the behaviors and who was involved at each stage, particularly how R&D teams observed customers, identified needs, and searched for solutions. Three of the authors then met together to create combined case histories for each project in each MNC's R&D unit. We created extensive figures, charts, and tables to tabulate and summarize data. We generated timelines of each R&D lab's structure and processes for each project.

Once we constructed the within-case analysis for each R&D project, we engaged in cross-case analysis, which centered on comparing cases of local modification against cases of global innovation. In both analyses, we used a replication logic to develop and confirm emergent theory (Yin, 2009). As constructs emerged from the first round of analysis, we iterated by recoding the data, and we created tables with quantitative information and illustrative quotes using the emergent constructs. We compared constructs across MNCs' R&D units, identifying patterns and refining emerging theory to provide new insights. We then used the case histories for within-case and cross-case analyses to understand the problem and solution search processes R&D teams engaged in as they undertook local modification or global innovation.

As we iterated between data and theory, we found that – consistent with existing literature – structural configurations involving interaction with lead customers and external experts were important for global innovation in some R&D units. However, we surprisingly found that other R&D teams produced global innovation even when they had violated these presumedly important structural configurations. We observed that structural configurations alone could not fully predict local modification or global innovation among R&D units. With this observation, we focused our

Table 2 R&D unit's project summary and assessment

Pseudonym	No. of patents with Chinese inventor 2010–2015	No. of global innovations in interviews	No. of modified local modifications in interviews	Dominant behavioral path and innovation outcome
Swallow	75	3	2	Known path to global innovation
Hawk	100+	1	0	Alternative path to global innovation
Magpie	10	2	2	Alternative path to global innovation
Finch	3	1	3	Mixed
Albatross	0	0	7	Known path to local modification
Sparrow	0	0	4	Known path to local modification
Total		7	18	

analysis on variation *within* structures rather than *across* structures. That is, we analyzed how different R&D teams' behaviors led to different outcomes, despite similar structural configurations of problem search (i.e., interacting with certain types of customers) and solution search (i.e., interacting with certain types of experts). Our analysis explored what behaviors were engaged in when interacting with a customer and what intentions underlay these behaviors – that is, what the R&D personnel intended to do within the process.

EMERGENT THEORETICAL FRAMEWORK

Our data revealed that R&D unit personnel who were able to research outside the common structural path of accessing lead customers and external experts exhibited two unique problem and solution search behaviors. These behaviors were (1) contextual observation of customers and (2) uncovering knowledge principles from experts.

Within the problem search phase, we found that R&D teams whose behaviors consisted of contextual observation with proximate customers began questioning assumptions about existing products and customer needs. These contextual observations started R&D teams on the path to global innovation by identifying important unmet customer needs that are traditionally only found from interactions with lead customers. Likewise, we found that when globally innovative R&D teams engaged in uncovering the principles behind a solution from internal partners, they were able to change global knowledge schemes embedded within the MNC (Oldroyd, Morris, & Dotson, 2019). These behavioral approaches document an important process that may provide an alternative path for emerging economies' R&D teams to develop global innovation capabilities (see Fig. 1).

In the following paragraphs, we elaborate on each set of problem and solution search behaviors and then compare the performance outcomes of different R&D units under different behavioral choices. In each instance, we found one dominant behavioral pattern for global innovations and another for local modifications across MNCs' R&D units. These outcomes were consistent across the different network structures, supporting a behavioral theory of global innovation.

Problem Search: Customer Interaction

Research has suggested that learning from customers is important to any company but that some customer interactions are likely to limit innovation to incremental and trivial product enhancements (i.e., local modifications; Bennett & Cooper, 1979; Frosch, 1996; Verganti, 2009). A key difference in the type of innovations the R&D teams develop seems to stem from what *type* of customer the teams listened to (von Hippel, 2005). Studies of innovation have suggested that working with lead customers can be an important source of innovation (e.g., Evans & Wolf, 2005; Fey & Birkinshaw, 2005; Prahalad & Ramaswamy, 2004; von Hippel, 1986, 2005). Lead customers know and can clearly articulate the problems of existing products and opportunities not yet developed. Thus, interacting with lead customers and involving them in the learning process can induce R&D personnel to recognize opportunities to innovate (Utterback, 1994), and serves as a vital source for potential innovation because the lead customer pushes traditional boundaries of a product (Baldwin, Hienerth, & von Hippel, 2006; Franke & Shah, 2003; Franke, von Hippel, & Schreier, 2006). The lead customer's role is important because they accurately identify needs other customers will have in the future. Moreover, because lead customers are likely to benefit from the solution, they often have a vested interest in helping to solve the problem. As such, interactions with lead customers can provide R&D teams with deep customer knowledge and keen market insights (Bogers, Afuah, & Bastian, 2010; Hienerth, 2006; Lüthje, Herstatt, & von Hippel, 2005), leading to global innovation (Carbonell, Rodríguez-Escudero, & Pujari, 2009).

We identified differences in R&D teams along two key factors of customer interaction. These included (1) the type of customer they interacted with (lead customer vs. proximate customer) and (2) the type of interaction with the customer (contextual observation vs. formalized interaction).

The known path: how problem search with lead customers leads to global innovation

Consistent with prior literature, some cases in our sample appeared to produce global innovations through the known structural problem search path of interacting with lead users. However, given the paucity of lead customers in any market, particularly in transitioning economy like China, this path was rarely observed in our study. In two instances, we found that R&D teams were able to interact with lead customers. These customers tended to be those who were pushing the boundaries of the product, not the casual user of the product (von Hippel,

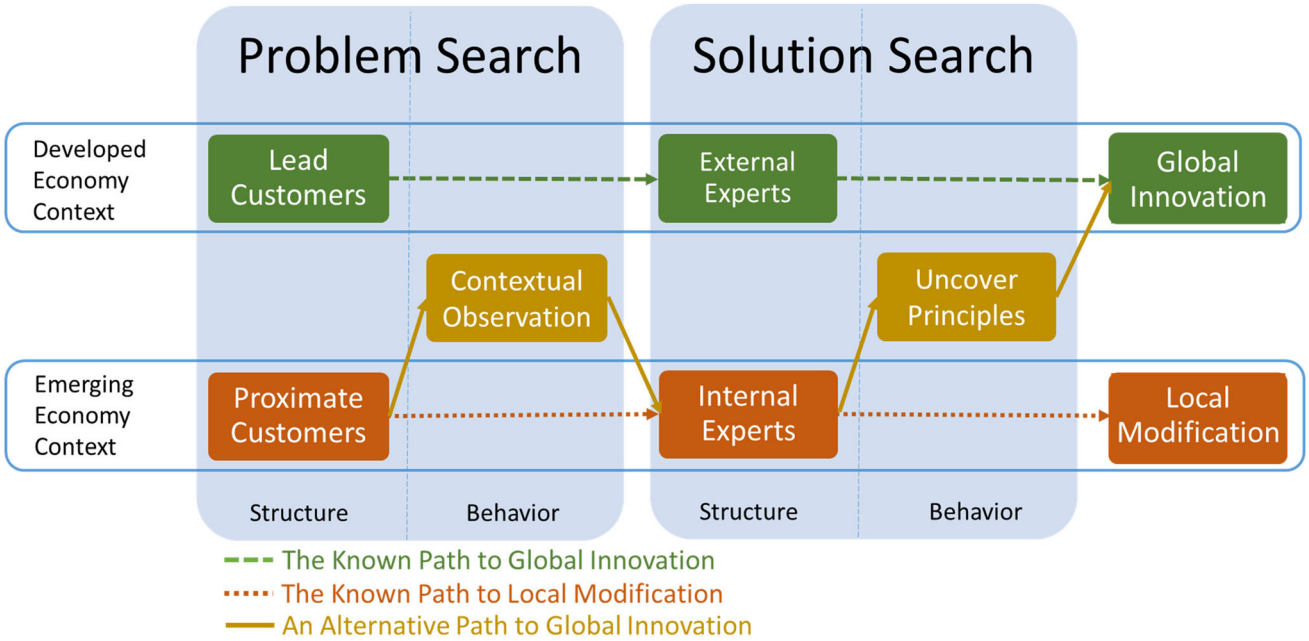

Figure 1 Paths of global innovation and local modification.

1986). In China, these lead customers often demand new and better-performing products while also demanding low prices. For instance, one project at a large German MNC, Swallow, evolved around a lead customer that was previously using a product from another MNC but felt that the MNC could not keep up with its demands. Such lead customers, as pointed out by one manager, were rare and difficult to find in China. The manager surmised that there were "only two" lead customers in all of China. As stated by a project member working on this project, "Customers have their requirements. Sometimes it can be very difficult problems …. The recent one is for wind farm layout optimization …. It's not an easy problem because the impact of the upstream wind turbine mill impacts wind speed of the down turbines." Many customers were unaware of these potential interactions.

Because of the sophisticated level of product knowledge this lead customer possessed, the Swallow R&D team could access information from the customer that had put into question the existing assumptions about the current product. Such findings are consistent with research on knowledge-based views as they relate to customer networks and the more relevant knowledge they are likely to possess (Govindarajan & Ramamurti, 2011; Jeppesen & Laursen, 2009).

The known path: how problem search from proximate customers leads to local modification

Consistent with prior literature, some cases in our sample appeared to produce local modifications through the known structural problem search path. Because proximate customers tend to have few major concerns with an existing product and do little to push the demands of a product market, these customers tend to get less attention from R&D units in developed markets as they do not represent the right kinds of opportunities for driving global innovation (Santos & Williamson, 2015).

However, because proximate customers represent the majority of customers in emerging economies, we found that the majority of the projects we examined interacted with proximate customers. In many cases, when the level of interaction was more formal, the local R&D team was not able to question assumptions about the existing product and predominately engaged in local modification of the product. For example, R&D teams at Albatross interacted with proximate customers indirectly through the sales and marketing units. "We don't directly connect with any customer. The customers always give their feedback to the sales and marketing department," said one R&D team member. "We have very little information on how the customer uses the machine. Not just technical issues but also how the customer uses the product."

The R&D teams at Albatross were primarily focused on finding preexisting solutions within the company to solve customer needs. One R&D manager noted, "The engineering manager will ask if this parameter will be feasible …. If it is feasible, we will start the project."

Even for the few R&D projects in which R&D personnel interacted directly with customers, their interactions were often formalized through official visits from the customer to discuss their needs in face-to-face meetings and online video calls. This type of interaction led the R&D team to focus on aligning their existing knowledge with the technical requests of the customer and ensuring that they were making sufficient product upgrades. Such thinking allowed the R&D team to provide valuable local modifications with incremental improvements in a timely manner to the customer.

An alternative path: how problem search from proximate customers leads to global innovation

Although we observed paths consistent with prior literature, we also observed anomalies that allowed us to identify alternative paths to global innovation. More specifically, and in contrast to learning from lead customers, another subset of R&D teams in our study interacted exclusively with proximate customers. Yet, surprisingly, these R&D teams could still achieve global innovation. Such findings were puzzling at first, but as we examined the data, we identified how behaviors might help teams overcome structural constraints in driving innovation. As mentioned by one R&D leader in our study, the first step in coming up with innovative ideas was not just interacting with or surveying the right kinds of customers but being deeply aware of their use of the product in the real-world context. This was particularly important for R&D teams in China, as most of their customers would not qualify as lead customers and would be unlikely to have identified and been able to articulate interesting problems. However, observing proximate customers in context allowed the R&D teams to perceptively notice undiscovered problems and unmet needs. Armed with this knowledge, they could then question the existing product design and develop novel innovations.

Those R&D teams that delved deeply into the experiences of proximate users were rewarded for their efforts. For example, an R&D team from Hawk implemented formal requirements to ensure that its members would engage in contextual observation to avoid simply local modification. One R&D executive explained, "We don't think an engineer in the lab is a good engineer. You must go to the market and go see the customer. We require all engineers to visit the customer site five times per year. Not revisit the customer five times; revisit the customer *site* five times. You should be involved in the installation, commissioning, and also in the test. You will ask, what's your product? How could you put that in the customer site?"

When R&D personnel visited their proximate customers' manufacturing sites, they were asked to actively observe and question basic details. Given that proximate users are unlikely to be aware of and articulate opportunities, the MNC placed the burden of identifying opportunities on its R&D staff. This detailed approach led to insights from the local environment. For example, R&D engineers in Hawk's lab noticed small delays that arose in a customer's manufacturing process when Hawk's machine was installed. Without contextual observation, they would not have noticed these small differences, or they would have assumed that the differences did not matter: "A three second delay [at one stage of the manufacturing process] … this is nothing. But in one year, over 200 million pieces. How much time is that? If you don't work [on the manufacturing site], this is small. It's just one drop of water, nothing. But to the customer, it's the ocean." The R&D team also noticed opportunities for design changes, by observing the "electricity [at the site] and the [machine] tuning, … then when you design, you will design it that way."

Contextual observation led engineers to question assumptions in a way that would have been difficult to replicate in an isolated lab or even in more formal interactions. The general tendency of R&D units was to engage with lead customers differently than they would with proximate or normal customers, with whom they were less likely to push the boundaries of a product. However, when R&D teams contextually observed proximate customers, they could replicate the insights gained from lead users and avoid slipping into local modification. Such observations in context sparked realizations that even proximate customers often used the product differently than imagined or intended by the R&D teams. These observations allowed teams to make global innovations that would have been unobservable in more formal customer interactions. These process findings support the notion that behaviors of contextual observation of the proximate customer are a key mechanism for global innovation in an emerging economy.

Proposition 1: R&D teams may be able to overcome lead-customer-access constraints to global innovation by engaging in contextual observation with proximate customers.

Consequently, much could be done to help foreign R&D teams in emerging economies to drive global innovation instead of carrying out local modification – for example, motivating the teams to deeply observe all types of customers in context; in a way that comprehensively contextualizes the customers' problems. Such efforts shift the MNC's focus to pay close attention to how they interact with proximate customers who may not seem to be pushing the boundaries of product use and instead use these contextual observations to internally push for greater questioning of existing assumptions about a product or process. By flipping more of the responsibility to R&D teams to observe customers in their context, these teams develop the capabilities needed to question assumptions about existing products and rely less upon the customer to articulate novel needs that will be valuable to the global market.

Solution Search: Global Expert Interaction

At the second stage of the global innovation process, R&D teams typically engage in broad solution search with noncompany (i.e., external) experts – often located in innovation hubs such as Silicon Valley for technology or Italy for leather – from whom the team can access world-class expertise that helps them come up with unique solutions (e.g., Laursen et al., 2012; Pietrobelli et al., 2004). However, scholars like McDermott and Corredoira (2010) have pointed out that firms in emerging economies often lack access to these world-class experts that would allow for a broad solution search. Instead, they find that R&D teams in emerging economies are more likely to turn to internal partners located in developed economies – experts who have deep R&D experiences and expertise. These solution search patterns are common to MNCs' R&D teams in emerging economies, which often lack an established knowledge base (Cantwell & Zhang, 2013; Madhok & Keyhani, 2012). To overcome these barriers to innovation, McDermott and Corredoira (2010) pointed out that foreign subsidiaries can successfully innovate if they or their internal partners have strong social connections to outside industry expert communities.

Consistent with knowledge-based views and the structural perspective, we found cases in our study that showed that having access to external experts increased global innovation and that having access only to internal partners in headquarters increased local modification. But we also found that while most foreign R&D units in China did not have access to experts outside of the MNC, many were still able to innovate globally (cf., McDermott et al., 2009). The difference was in the interaction with in-house experts. By uncovering general knowledge principles from internal partners in MNC headquarters, local R&D units could come up with more global innovations.

Principles provide general law or truth to guide decisions (Baden-Fuller & Winter, 2005). A principle may be a list of best practices, key questions, or cause-and-effect associations that provide a theoretical explanation for why the principle might be useful as a general guideline for other projects or products (Oldroyd et al., 2019). The process of uncovering principles is likely to increase a unit's ability to respond to specific customer needs because principles are, by nature, flexible and adaptable to multiple contexts (e.g., Jonsson & Foss, 2011). When R&D personnel uncover principles from in-house experts, they are able to apply knowledge to new contexts in a way that encourages innovation. In essence, how these R&D teams reached out to inside experts mattered, so much so that *how* they interacted is a critical mechanism in global innovation (see Table 3 for summaries and Appendix Tables 4 and 5 for additional supporting quotes).

Our data suggests that the extent to which R&D teams were able to innovate was dependent on a number of core learning elements, including (1) the type of experts they interacted with and (2) the level of uncovering general knowledge principles from experts. This behavior of uncovering principles seemed to be key to allowing the R&D units that had less access to external experts to effectively utilize knowledge in a way that enabled global innovation.

The known path: How solution search from external experts leads to global innovation

Consistent with prior literature, some cases in our sample appeared to produce global innovations through the known structural solution search path. For example, a few R&D teams in our study were able to overcome the barriers often encountered by emerging economies' R&D teams and participated

Table 3 Summary of company processes and outcomes

Pseudonym	Problem search		Solution search		Dominant outcome
	Who (Structural)	How (Behavioral)	Who (Structural)	How (Behavioral)	
Swallow	Lead customers	Moderate contextual observation	External experts	Principles-based learning	Global innovation
Hawk	Proximate customers	High contextual observation	Internal experts	Principles-based learning	Global innovation
Magpie	Proximate customers	High contextual observation	Internal experts	Principles-based learning	Global innovation
Finch	Proximate customers	Moderate contextual observation and formalized interaction	Internal experts	Principles-based learning	Mixed
Albatross	Lead and proximate customers	Formalized interaction	Internal experts	Templates-based learning	Local modification
Sparrow	Proximate customers	Formalized interaction	Internal experts	Templates-based learning	Local modification

in what can be considered a broad search by engaging with outside experts in developed markets (Rosenkopf & Nerkar, 2001). These findings are consistent with extant research that shows how reaching out to geographically distant experts for knowledge can lead to greater innovation (e.g., Morris et al., 2015; Powell, Koput, & Smith-Doerr, 1996).

Within Swallow R&D teams, this broad search was exemplified through contact with global outside experts and their research. For example, an R&D team established a pattern of reaching out to diverse groups both internal and external to the MNC, such as in places like Silicon Valley, since this represented a ferment of ideas for the team in China. This team was able to overcome structural constraints through local members who had previously worked in foreign countries for foreign firms. The R&D team leader noted that their interaction approach was to "find out what the state of the knowledge is, to dig in to make some creative ideas." Another R&D member pointed out, "We have the capability to [solve] some difficult problems …. We reviewed almost all the academic papers in that area. The majority are not from people from North America. When we look at the papers, formulas, we can see they are not so advanced. We can see there is definitely room for us to innovate." This discussion demonstrated that the R&D teams at Swallow tend to conduct broad solution searches among outside experts. It also showed that these external experts were particularly good at uncovering the general knowledge principles that could be used to disrupt existing knowledge schemas perpetuated by the MNC and even the industry.

Through these interactions, Swallow's R&D teams in China felt more confident in their ability to understand how the problem might be resolved with the new technology and how they might contribute to the overarching state of knowledge in the field. For instance, one R&D manager explained that many of their R&D projects dealt with "different layers, but the base is the core platform." Since this MNC was a software development company, the many layers dealt with layers of code and core platforms. By understanding these core platforms (i.e., knowledge principles), the R&D team was able to not only apply the new knowledge from outside experts but also point out bugs and fixes that could improve upon existing code developed by R&D teams in Silicon Valley.

The known path: How solution search from internal experts leads to local modification

Consistent with prior literature, some cases in our sample appeared to produce local modifications through the known structural problem search path. Some teams in our study found themselves in a common dilemma highlighted by knowledge-based research that interaction with internal partners does not provide sufficient opportunity to be exposed to multiple outside ideas and is unable to produce global innovation (e.g., Doz, Santos, & Williamson, 2001; Morris et al., 2015; Schotter et al., 2017).

We found that many R&D teams in our sample who reached out to internal experts were likely to develop local modification. This outcome occurred because these teams tended to engage with partners in a resource-dependent manner, a common relationship dynamic between emerging and developed economies' teams (Luo, Shenkar, & Nyaw, 2002), drawing upon existing knowledge templates rather than seeking to uncover underlying principles. This resource dependence was likely a result of historical relationships emerging economies' R&D members had with MNC HQ, in which HQ was seen as the primary source of knowledge, and the subsidiary was seen as the implementer of the knowledge. For example, an R&D team at Sparrow limited its interactions to internal partners in MNC HQ and was rarely able to develop globally innovative solutions. According to R&D team members, interactions with MNC HQ were infrequent; the team interacted with HQ only to exchange R&D project specifications and to gather existing knowledge templates that were then used to adapt to the local customers' needs. Even when the R&D team understood that the solution was "not always right, and what he [the HQ expert] says is not necessarily right," they simply applied the provided template solution anyway.

In this regard, interactions with internal experts tended to lead to local modification. For instance, while R&D personnel of such teams at Sparrow traveled to the MNC HQ in the US, they found these trips to be ineffective for innovation. "We send staff members to the US, hoping they will bring back some new ideas. But some members sent there are plodders (a willing ox)," said one R&D team member. "They just do their job and rarely place interest on other things." As one R&D manager pointed out regarding R&D teams that produced local modification, "They hardly put forth any [new] proposals, as they think the Americans are more professional and competent." Simply drawing on the knowledge templates of the MNCs was typically not valuable for global innovation because it did not change the knowledge schemas of the R&D teams in China.

For example, an R&D team at Albatross was deployed to develop a new feature for its machine for a customer. To solve the problems, the R&D team asked the customer what was not working and then used that information as a starting point to "contact and collaborate with Sweden [HQ] to solve the problems," said one R&D employee. The Albatross R&D team would ask the HQ R&D team, "Hey, can you help us fix this for the local market?" This behavior establishes a relationship in which the R&D team in China is positioned in a resource-dependent relationship, with the MNC HQ playing the role of an expert knowledge disseminator. The result is sharing and using existing knowledge templates to solve the local problem. For example, this R&D employee noted that templates were transferred in the form of technical files, and then necessary local adaptations were made. He remarked, "There is a big R&D branch where they develop the equipment in Sweden, and then the equipment templates will be transferred to Nanjing. Not only the technical, the total technical files and all the materials and also the production will be transferred to [our local R&D group]. And a day after the technical materials and technical documents and other studies are finished, then production will send [an engineer] to Sweden to understand how the product should be developed." In this case, knowledge templates were used to first replicate the product from Sweden, and then later, local modifications were made (Jensen & Szulanski, 2007). Another R&D employee in the same company shared that he referenced a templated model from an R&D unit in the US and then worked with the local supplier to make adaptations. He stated, "To design the local model, we will take reference from current models to design some of the functions. Then we will redesign all the structures, hydraulic systems, and make a little bit of a modification. Because we already have the reference model from the US, we will send the drawing to local suppliers to localize the parts." In both cases, people were reaching out from their geographic location to developed markets to access more how-to forms of knowledge found in existing templates (see case comparisons in Table 3 and additional supporting quotes in Appendix Tables 4 and 5).

An alternative path: solution search from internal experts leads to global innovation

Although we observed paths that appeared consistent with prior literature, we also observed anomalies that allowed us to identify an alternative solution search path to global innovation. The differentiator was in the behaviors they exhibited. These R&D teams would persist in solution search processes of *uncovering general knowledge principles*. These R&D teams in China uncovered underlying principles, even though their knowledge sources were consistent with "local search" processes that

have been shown to result in local modification (Rosenkopf & Nerkar, 2001; Stuart & Podolny, 1996). The globally innovative R&D teams questioned the assumptions behind the original solutions from the developed economies' R&D units of the firm. When these R&D teams in China saw something that was not consistent with existing technology, they developed an additional level of competency concerning product use, from which they approached the internal experts and engaged in a type of principle-based learning (Berry, 2014; Kumaraswamy, Mudambi, Saranga, & Tripathy, 2012).

This learning behavior was key for the R&D teams in emerging economies that lacked access to "advanced science and technology capabilities" in the global MNC and often depended more upon templates from developed economies to offer alternative open network paths for capability development (Cantwell & Zhang, 2013). However, by engaging in solution search behaviors that focused on uncovering knowledge principles, these R&D teams overcame the challenges of not having sufficient knowledge stock to develop global innovation. For example, Magpie, a high-precision instrument manufacturer, was working on developing a new instrument for customers in China. Magpie reached out to its HQ counterparts once it identified that some of the components were not necessary for the existing product that had been developed in Switzerland. When asked what components they were going to keep from the original Swiss model, the project manager replied, "Nothing…. We did not simply use the new technology [from HQ]. Everything [developed here in China] is new." The R&D manager commented on the need to understand the core technology of the product but not of the existing product itself.

When asked about the knowledge exchanged with the Swiss R&D unit, the R&D manager in China responded, "[We] are still doing some testing comparing [our new prototype product] with the existing [instrument]. Their [instrument] will work for six hours to get one result. But our [new] product needs only eight minutes…. So [we] needed to check whether they can trust our product or not. They did the test…. Now the feedback was good." The customer feedback the R&D team in China received was also very valuable to the Swiss R&D unit: they saw how local market knowledge might help them uncover some principles about the technology. In particular, these knowledge principles from the R&D team in China were vital to solving a similar problem faced by many pharmaceutical companies in Switzerland and globally; these companies needed to more effectively and efficiently determine the moisture content of a drug capsule to determine whether it met industry standards.

Moreover, when asked whether the R&D team in China talked to the Swiss R&D unit only when they ran up against an obstacle, the response was no: "Sometimes we discuss general ideas that might be good, or we question whether this is true [or not]." The R&D team in China that developed global innovation had developed a type of capability around understanding the theory or science behind the knowledge being shared with them. This capability led the team to uncover general principles that allowed them to redesign both the components and the architecture of the existing technology (Henderson & Clark, 1990).

Regarding another project within Magpie, we discussed the development process of a recent project in which an R&D team tried to develop an innovation for a measurement technology used in an industrial environment. This measurement technology was central in the aerospace and automotive industries. Many of the existing products in the company relied on established technology it had developed back in the 1990s in Switzerland. Because Chinese and other emerging economies' customers had different requirements, and because the current technology was so old, the R&D team in China decided to develop a new-generation product that was smaller, lower in cost and had much better accuracy than existing technology in the market.

After engaging with proximate customers in the Chinese market, the R&D project manager said, "The basic theory is common, but you know, if we want to go to the [new] solution it is not only the theory [that matters]. It relies on the structure. It relies on the electronics, the design. So we have to improve everything from the inside." He continued, "The most difficult part is the temperature effects. Because the resolution [we need] is so high, any minor change of the environment temperature will cause the change of the magnet." The manager further explained that coming up with new technology with such high resolution created problems for which no one within the MNC had ready-made solutions. Through the process of uncovering principles from the internal partners, the R&D team in China was able to develop not only relevant knowledge of the inability of the components to

meet customer needs but also assurance that the way the components were configured would meet the demands of the market.

To figure out how to develop an innovative solution to these problems, the R&D team in China reached out to the Swiss R&D unit to make sure they understood the core technology and to receive some suggestions on what might help them ascertain how to solve the problems related to "temperature effects." Here, the Chinese R&D manager pointed to the need to uncover deeper principles from the Swiss units to ensure the solution was beneficial to the emerging economies context. He commented:

> They [the Swiss unit] are more experienced than us, so we go to them to ask whether they have already met such a problem and how they solved the problem. But you know, the conditions are different. The situations are different. So their solution is maybe not our solution. So we just try to get underlying experience from them. We are not necessarily looking for a solution. But they can give you some suggestions. Because much of their know-how is not documented. It's in their head.... Usually everybody needs to understand that and make many tests and then see if we can find a solution.

Finally, an R&D team at Finch, despite having limited interaction with internal partners, was able to engage in global innovation. They were very focused on going beyond application; they wanted to understand core principles. Their R&D team leader noted, "Most of our [global collaboration] projects focus on understanding [principles]." The R&D team even redefined what they meant by success to help them move beyond a product focus and instead highlight the importance of understanding the fundamental principles of advancements in their core technology. The R&D team leader noted, "When we say one of our projects is successful, we do not simply mean we have successfully delivered a new product to the market. Mostly, we mean we have succeeded in creating some new understanding. Those understandings can be used as a platform to build new projects." This understanding became the basis for future success and emboldened the team to continue to pursue global innovation. But such internal partner engagement required the R&D team at Finch to engage in sharing deep-rooted principles and to "focus on understanding," as one R&D employee pointed out. In this regard, the solution search behaviors demonstrated within one's knowledge network were more meaningful than the people who were in the network (McDermott & Corredoira, 2010; Pietrobelli & Rabellotti, 2011; Uzzi & Lancaster, 2003).

Proposition 2: R&D teams may be able to overcome external-expert access constraints to global innovation by uncovering knowledge principles from internal experts.

DISCUSSION

The purpose of this research was to provide an understanding of how MNC R&D units in China develop a global innovation capability. We identified that a common alternative path to global innovation was achieved through contextual observation of proximate customers and through uncovering knowledge principles through interaction with internal experts. Our findings shed light on the behaviors that enable foreign R&D units in emerging economies to engage in global innovation. By grounding our theory in this specific context, we were able to build a process theory: from a structural perspective, what may appear to be a process oriented toward local modification could actually be oriented toward global innovation. This theory worked in a specific set of cases within an emerging economy and depending on how R&D teams behaved. Our study may provide an opportunity to reconsider some of our fundamental assumptions about the mechanisms underpinning MNCs' innovation capabilities in all economies.

Theoretical Implications

While it is true that knowledge-based views have increasingly called for more behavioral approaches to understanding innovation, much of this work has continued to focus on the structural mechanisms needed to drive specific knowledge behaviors (Andersson et al., 2015; Foss & Pedersen, 2019; Meyer et al., 2020; Monteiro, 2015). For example, scholars have adopted notions of absorptive capacity, which is largely a function of the level of the firm's prior knowledge, as a way to understand how external knowledge is accessed or integrated (Cohen & Levinthal, 1990). Likewise, Brown and Duguid (1991) pointed out the need to develop communities-of-practice as a way to understand how organizational actors share knowledge through collaboration and joint work across organizational boundaries to innovate. Finally, scholars have

pointed to specific dynamic capabilities around building and reconfiguring internal and external knowledge to innovate and address rapidly changing environments (Teece, Pisano, & Shuen, 1997).

These behavioral approaches to innovation have established that knowledge is held by individuals and that how this knowledge is accessed and applied depends on the behaviors of individuals within the organization. However, such approaches have primarily remained at the strategic level of explaining behavior in terms of organizations as governance mechanisms and the need to develop specific types of organizational capabilities that drive innovation. Moreover, this work tends to identify organizational and network structures that economize on behaviors that lead to the access and integration of knowledge within the firm, but the work does not identify what these behaviors actually are (e.g., Eisenhardt & Santos, 2002; Kogut, 2000). As noted by Foss and Pedersen (2019), much of the microfoundations' work examining individual knowledge behaviors in the field of strategy tends to focus on the "contextual" or "structural" factors as drivers of behavior. Foss and Pedersen (2019: 1598) pointed out that such an approach to innovation can be helpful in answering the question, "How can MNCs create, build, source, share, etc. the knowledge that brings advantage?" But unfortunately, this approach does not address the question "How is the capability in question identified" in the first place?

By taking a grounded theory approach, we were able to identify both the structural and behavioral elements of global innovation capabilities. Our findings point to an extension of the knowledge-based view of the firm by examining the behavioral elements of the innovation process at the unit level. The knowledge-based view of the firm assumes that foreign units are a vital source of new knowledge and that the MNC exists to combine and integrate this knowledge to create value (Kogut & Zander, 1993). Yet, this assumption depends on the R&D unit's ability to generate new and valuable knowledge for the MNC. As noted by Foss and Pedersen (2019), most of the work taking a knowledge-based view of MNCs involves empirical measurement at the level of the MNC or subsidiary but does not examine the individual- or team-level processes of knowledge access and integration. Hence, our study might help managers to more effectively take into account the behaviors of actual individuals as they relate to innovation capabilities for the subunit and allow MNCs to then distill what types of governance or structural mechanisms they might put into place to ensure greater innovation from their employees.

Finally, our study underscores the importance of understanding that the process of innovation (and not just its structure) should begin by examining how R&D units search for customer problems and then search for ways to solve them. This observation is consistent with the work by Nickerson et al. (2007), who argued that individuals cannot specify a priori the knowledge they wish to obtain because, more often than not, this knowledge does not yet exist. What R&D unit members can do, however, is identify problems customers are facing and then engage in a search process to identify a solution to those problems. By engaging in this two-phase process of problem and solution search, R&D units in an emerging economy may become the locus of value creation for the organization – something often undertheorized in the international business literature (Herrigel, Wittke, & Voskamp, 2013).

Practical Implications

Beyond the need for MNCs to continue to grow and remain profitable, innovation in emerging economies creates prosperity and social equality and provides MNCs with a stronger foothold in the global economy (Di Sibio, 2021). Multinational firms recognize that emerging economies tend to have large young populations that are digitally savvy, embrace change, and are open to experimenting with new technologies and products. Yet, foreign firms continue to struggle to build innovation capabilities within their R&D units in emerging economies. The reason for this has a lot to do with the fact that lead customer markets and markets with high levels of external experts are characterized by high per capita income, high customer sophistication, and high-quality infrastructure (Beise, 2004; Jänicke & Jacob, 2004). As such, developed markets are seen to provide the customer with the stimuli and external knowledge base needed for most global products of an MNC (Bartlett & Ghoshal, 1990). In turn, China may still struggle with a lack of lead customers in some markets and does not have the abundance of external networks that developed markets do, and is seen as a second-tier source of global innovation (Cantwell & Mudambi, 2011; Corredoira & McDermott, 2014; Parente et al., 2021). And yet, we found that R&D units in an emerging economy can be sources of first-tier global innovation. Innovation in these settings does not come from simply connecting R&D units with the right networks. Rather, innovation comes about as

individuals inside these units demonstrate specific behaviors that help them to more effectively access and integrate relevant knowledge, regardless of the knowledge source.

Of course, driving these behaviors requires that managers engage in unconventional approaches to innovation, shifting their focus from "who" has the relevant knowledge to "how" relevant knowledge might be accessed and integrated, even when the sources may seem limited in the knowledge they have to share (McDermott & Pietrobelli, 2017; Perez-Aleman, 2011). This is particularly important in emerging economies or even in peripheral regions in developed economies, where teams may not be able to gain access to lead customers or external experts. Hence, the team will need to draw upon alternative approaches that consist of alternative paths to innovation. In particular, managers should incentivize employees to engage in the following behaviors: (1) contextual observation, leading employees to question the assumptions about existing products and processes, and (2) uncovering principles from inside experts in HQ or other foreign locations, leading teams to recombine socially complex knowledge into a new context, thereby generating novel and innovative solutions.

Because some of the foreign R&D units embedded in China lacked sufficient structural networks, members from these units had to make do with what they had (proximate customers representing everyday local user needs and internal experts in headquarters and other peer subsidiaries). Such limitations, though more common in emerging economies, are also likely to be found in many peripheral locations in developed markets. Examining behaviors in these contexts and comparing them to existing research on cross-border innovation allowed us to show that how someone access knowledge might be just as (or more) impactful as who they access that knowledge. For example, what may look like mere local modification activities in network-constrained environments may actually be innovation-oriented activities based on the specific behavioral processes that the R&D unit engaged in as they interacted with customers and experts. As a result, we noted specific instances in which managers in the foreign R&D unit directed team efforts that aligned with these specific behaviors. Hence, we believe our research provides valuable insights to managers operating in both emerging and developed economies, uncovering a new process for global innovation.

Limitations and Future Research

While our research has some distinct advantages, it also faces several challenges. First, because this study focuses on R&D units in China that are part of large MNCs, its generalizability may be limited to innovation efforts for foreign MNCs operating in China. However, based on significant research on innovation within multiple emerging economies, we believe that China possesses many of the constraints represented in many other emerging economies. For example, China's lack of external experts consisting of industry leaders, local universities, science labs, public sector organizations, and institutional networks is a similar deficiency found in other emerging economies like India, Argentina, Russia, Brazil, Indonesia, and Vietnam (Cantwell & Mudambi, 2011; Corredoira & McDermott, 2014; Parente et al., 2021). Hence, we believe our research sample is conservative, and this research can be generalized outside of China, uncovering a process that is typically difficult to measure in all economies constrained by strong knowledge networks. Such grounding can help to provide insights for future research on innovation in all economies (Hernandez & Guillén, 2018).

Second, while most of the R&D teams and projects in our study engaged in problem and solution searches that were consistent in promoting local modification or global innovation, there were projects within some of the units that possessed aspects of both. While these types of process variations did occur, they were less common and related to some of the trigger factors that sent a team down one path over another. For example, an R&D manager started out with local modification by interacting with the customer, but the manager could not find a suitable template to work with. Rather than solely interacting with the customer, the R&D team then started interacting with global experts and reengaged in questioning the assumptions of such local modifications. This started the team on a path of uncovering principles. While this variation did occur in our data, upon deeper analysis, we can see that the same behaviors were at play, but only where the questioning of assumptions occurred during the solution search phase and not the problem search phase.

Third, while our research posits that the exhibited behaviors triggered global innovation, there is certainly a possibility that the R&D teams were tasked with either global innovation or local modification projects a priori. If the latter is the case,

then the R&D personnel chose behaviors that were most compatible with the job. If the R&D personnel were choosing these behaviors based on compatibility with innovation/modification, and we assume they were somewhat rational individuals, then the fact that they engaged in these different behaviors bolsters our argument that certain behavioral processes are more likely to lead R&D teams to global innovation, while other behavioral processes are more likely to lead to local modification. In short, we believe the true value of this research is not whether the R&D personnel choose the behaviors of innovation/modification first but rather whether certain processes are better aligned to develop global innovation and others, to develop local modification. In summary, the variance in innovation outcomes the teams experienced is key to our research and highlights the need to understand the learning process. In some ways, we hope our findings help mitigate the endogeneity issue for future studies by providing clear recommendations for global R&D leaders as they seek to generate global innovation.

Given our research intent to understand the process of global innovation, future research might engage in understanding the complexities involved when an R&D unit might have a desire to innovate or modify. Does this lead to more fluid or even hybrid models of innovation, in which customer-pulled innovation may begin to look more like science-pushed research if the solution search process is more exploratory in nature, but the problem search process is strictly exploitative? Moreover, does contextual observation in the problem search phase and drawing upon templates from few internal partners in the solution search phase lead to a constant spinning of wheels, in which units are constantly able to identify big problems but never able to come up with solutions to those problems because they have not uncovered principles (March, 1991)? Such problems may exist only temporarily, as Szulanski and Jensen (2006) might argue that eventually, the R&D unit will turn to a deeper level of learning to address the necessary adaptations needed to turn the existing template into a truly innovative product.

CONCLUSION

This paper uncovered an alternative path to global innovation in an emerging economy context. In particular, when traditional structural paths to innovation are not readily available, through behaviors of contextual observation of proximate customers and uncovering knowledge principles from internal experts, R&D units can develop global innovation capabilities. That is, local modification and global innovation are not determined so much by *who* R&D unit personnel in emerging economies interact with (i.e., local customers and global experts) but rather by *how* the personnel interact with them. This model suggests that as MNCs in emerging and developed economies expand their R&D operations to move from local modification to global innovation, they would benefit from being in tune with the actual behaviors of R&D personnel rather than just the structure of the innovation process or their social networks.

NOTES

[1]As proof of these aspirations, we held a full-day focus group and workshop with 30 heads of R&D units in China. We asked these R&D heads to respond to a series of questions regarding their innovation efforts, resources devoted to R&D, and examples of global innovations coming out of China. From this original group of R&D units, we selected the six foreign R&D units most interested in global innovation and most willing to participate in the study.

REFERENCES

Albert, D., & Siggelkow, N. 2022. Architectural search and innovation. *Organization Science,* 33(1): 275–292.

Andersson, U., Buckley, P. J., & Dellestrand, H. 2015. In the right place at the right time! The influence of knowledge governance tools on knowledge transfer and utilization in MNEs. *Global Strategy Journal,* 5(1): 27–47.

Argote, L., Aven, B. L., & Kush, J. 2018. The effects of communication networks and turnover on transactive memory and group performance. *Organization Science,* 29(2): 191–206.

Awate, S., Larsen, M. M., & Mudambi, R. 2015. Accessing vs. sourcing knowledge: A comparative study of R&D internationalization between emerging and advanced economy firms. *Journal of International Business Studies,* 46(1): 63–86.

Baden-Fuller, C., & Winter, S. 2005. Replicating organizational knowledge: Principles or templates?

Baldwin, C., Hienerth, C., & von Hippel, E. 2006. How user innovations become commercial products: A theoretical investigation and case study. *Research Policy,* 35(9): 1291–1313.

Bartlett, C. A., & Ghoshal, S. 1990. Managing innovation in the transnational corporation. *Managing the Global Firm*, 215-255.
Beise, M. 2004. Lead markets: Country-specific drivers of the global diffusion of innovations. *Research Policy,* 33(6–7): 997–1018.
Bennett, R. C., & Cooper, R. G. 1979. Beyond the marketing concept. *Business Horizons,* 22(3): 76–83.
Berry, H. 2014. Global integration and innovation: Multicountry knowledge generation within MNCs. *Strategic Management Journal,* 35(6): 869–890.
Berry, H., Guillén, M. F., & Zhou, N. 2010. An institutional approach to cross-national distance. *Journal of International Business Studies,* 41(9): 1460–1480.
Bogers, M., Afuah, A., & Bastian, B. 2010. Users as innovators: A review, critique, and future research directions. *Journal of Management,* 36(4): 857–875.
Bogliacino, F., & Pianta, M. 2010. Innovation and employment: A reinvestigation using revised Pavitt classes. *Research Policy,* 39(6): 799–809.
Bremner, R.P., Eisenhardt, K.M. and Hannah, D.P., 2017. Business ecosystems. In *Collaborative Strategy*: 215–223. Edward Elgar Publishing.
Breznitz, D., & Murphree, M. 2011. *Run of the red queen: Government, innovation, globalization, and economic growth in China*. New Haven: Yale University Press.
Brown, J. S., & Duguid, P. 1991. Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science,* 2(1): 40–57.
Caner, T., Cohen, S. K., & Pil, F. 2017. Firm heterogeneity in complex problem solving: A knowledge-based look at invention. *Strategic Management Journal,* 38(9): 1791–1811.
Cantwell, J., & Mudambi, R. 2005. MNE competence-creating subsidiary mandates. *Strategic Management Journal,* 26(12): 1109–1128.
Cantwell, J. A., & Mudambi, R. 2011. Physical attraction and the geography of knowledge sourcing in multinational enterprises. *Global Strategy Journal,* 1(3–4): 206–232.
Cantwell, J. A., & Zhang, F. 2013. Do foreign-owned subsidiaries in China follow a distinctive pattern of technological knowledge sourcing? *Management and Organization Review,* 9(3): 489–512.
Carbonell, P., Rodríguez-Escudero, A. I., & Pujari, D. 2009. Customer involvement in new service development: An examination of antecedents and outcomes*. *Journal of Product Innovation Management,* 26(5): 536–550.
Cohen, W. M., & Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly,* 1: 128–152.
Cohen, S. L., Bingham, C. B., & Hallen, B. L. 2019. The role of accelerator designs in mitigating bounded rationality in new ventures. *Administrative Science Quarterly,* 64(4): 810–854.
Corredoira, R. A., & McDermott, G. A. 2014. Adaptation, bridging and firm upgrading: How non-market institutions and MNEs facilitate knowledge recombination in emerging markets. *Journal of International Business Studies,* 45(6): 699–722.
Cuypers, I. R., Ertug, G., Cantwell, J., Zaheer, A., & Kilduff, M. 2020. Making connections: Social networks in international business. *Journal of International Business Studies,* 51(5): 714–736.
Davis, J. P., & Eisenhardt, K. M. 2011. Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly,* 56(2): 159–201.
Di Sibio, C. 2021. How collaboration is leading the new innovation in emerging markets. https://www.ey.com/en_us/digital/how-collaboration-is-leading-to-new-innovation-in-emerging-markets. Accessed February 10, 2021.
Doz, Y. L., Santos, J., & Williamson, P. J. 2001. *From global to metanational: How companies win in the knowledge economy*. Boston: Harvard Business Press.
Edris, S., & Cantwell, J. 2020. International knowledge sourcing by foreign MNE subunits: Competence creating vs. exploiting. In *Academy of Management Proceedings,* 2020(1): 21384.
Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review,* 14(4): 532–550.
Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: Opportunities and challenges. *Academy of Management Journal,* 50(1): 25–32.
Eisenhardt, K. M., & Santos, F. M. 2002. Knowledge-based view: A new theory of strategy. *Handbook of Strategy and Management,* 1(1): 139–164.
Elango, B., & Pattnaik, C. 2007. Building capabilities for international operations through networks: a study of Indian firms. *Journal of International Business Studies,* 38(4): 541–555.
Elsbach, K. D., & Kramer, R. M. 2003. Assessing creativity in Hollywood pitch meetings: Evidence for a dual-process model of creativity judgments. *The Academy of Management Journal,* 46(3): 283–301.
Evans, P., & Wolf, B. 2005. Collaboration rules. *IEEE Engineering Management Review,* 33(4): 50.
Fey, C. F., & Birkinshaw, J. 2005. External sources of knowledge, governance mode, and R&D performance. *Journal of Management,* 31(4): 597–621.
Foss, N. J., & Pedersen, T. 2019. Microfoundations in international management research: The case of knowledge sharing in multinational corporations. *Journal of International Business Studies,* 50(9): 1594–1621.
Franke, N., & Shah, S. 2003. How communities support innovative activities: An exploration of assistance and sharing among end-users. *Research Policy,* 32(1): 157–178.
Franke, N., von Hippel, E., & Schreier, M. 2006. Finding commercially attractive user innovations: A test of lead-user theory*. *Journal of Product Innovation Management,* 23(4): 301–315.
Frosch, R. A. 1996. The customer for R&D is always wrong! *Research Technology Management,* 39(6): 22–27.
Funk, R. J. 2014. Making the most of where you are: Geography, networks, and innovation in organizations. *Academy of Management Journal,* 57(1): 193–222.
Genin, A. L., Tan, J., & Song, J. 2021. State governance and technological innovation in emerging economies: State-owned enterprise restructuration and institutional logic dissonance in China's high-speed train sector. *Journal of International Business Studies,* 52(4): 621–645.
Glaser, B. G., & Strauss, A. L. 1967. *The discovery of grounded theory: Strategies for qualitative research*. New Brunswick: Aldine.
Govindarajan, V., & Euchner, J. 2012. Reverse Innovation. *Research-Technology Management,* 55(6): 13–17.
Govindarajan, V., & Ramamurti, R. 2011. Reverse innovation, emerging markets, and global strategy. *Global Strategy Journal,* 1(3–4): 191–205.
Grant, R., & Phene, A. 2021. The knowledge based view and global strategy: Past impact and future potential. *Global Strategy Journal.*
Henderson, R.M. and Clark, K.B., 1990. Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative science quarterly*: 9–30.
Hernandez, E., & Guillén, M. F. 2018. What's theoretically novel about emerging-market multinationals? *Journal of International Business Studies,* 49(1): 24–33.
Herrigel, G. 2015. *Experimentalist systems in manufacturing multinationals*. Unpublished paper, Department of Political Science, University of Chicago, Chicago, IL.
Herrigel, G., Wittke, V., & Voskamp, U. 2013. The process of Chinese manufacturing upgrading: Transitioning from unilateral to recursive mutual learning relations. *Global Strategy Journal,* 3(1): 109–125.

Hienerth, C. 2006. The commercialization of user innovations: The development of the rodeo kayak industry. *R&D Management,* 36(3): 273–294.
Jänicke, M., & Jacob, K. 2004. Lead markets for environmental innovations: A new role for the nation state. *Global Environmental Politics,* 4(1): 29–46.
Jensen, R. J., & Szulanski, G. 2007. Template use and the effectiveness of knowledge transfer. *Management Science,* 53 (11): 1716–1730.
Jeppesen, L. B., & Laursen, K. 2009. The role of lead users in knowledge sharing. *Research Policy,* 38(10): 1582–1589.
Jonsson, A., & Foss, N. J. 2011. International expansion through flexible replication: Learning from the internationalization experience of IKEA. *Journal of International Business Studies,* 42(9): 1079–1102.
Kogut, B. 2000. The network as knowledge: Generative rules and the emergence of structure. *Strategic Management Journal,* 21(3): 405–425.
Kogut, B., & Zander, U. 1993. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science,* 3(3): 383–397.
Kostova, T., & Roth, K. 2002. Adoption of an organizational practice by subsidiaries of multinational corporations: Institutional and relational effects. *Academy of Management Journal,* 45(1): 215–233.
Kramer, J. P., Marinelli, E., Iammarino, S., & Diez, J. R. 2011. Intangible assets as drivers of innovation: Empirical evidence on multinational enterprises in German and UK regional systems of innovation. *Technovation,* 31(9): 447–458.
Kumaraswamy, A., Mudambi, R., Saranga, H., & Tripathy, A. 2012. Catch-up strategies in the Indian auto components industry: Domestic firms' responses to market liberalization. *Journal of International Business Studies,* 43: 368–395.
Laursen, K., Masciarelli, F., & Prencipe, A. 2012. Regions matter: How localized social capital affects innovation and external knowledge acquisition. *Organization Science,* 23(1): 177–193.
Li, J., & Fleury, M. T. 2020. Overcoming the liability of outsidership for emerging market MNEs: A capability-building perspective. *Journal of International Business Studies,* 51: 23–37.
Li, X., Quan, R., Stoian, M. C., & Azar, G. 2018. Do MNEs from developed and emerging economies differ in their location choice of FDI? A 36-year review. *International Business Review,* 27(5): 1089–1103.
Liu, X., Lu, J., Filatotchev, I., Buck, T., & Wright, M. 2010. Returnee entrepreneurs, knowledge spillovers and innovation in high-tech firms in emerging economies. *Journal of International Business Studies,* 41(7): 1183–1197.
Lorenzen, M., Mudambi, R., & Schotter, A. 2020. International connectedness and local disconnectedness: MNE strategy, city-regions and disruption. *Journal of International Business Studies,* 51(8): 1199–1222.
Luo, Y., Shenkar, O., & Nyaw, M. K. 2002. Mitigating liabilities of foreignness: Defensive versus offensive approaches. *Journal of International Management,* 8(3): 283–300.
Luo, Y., Sun, J., & Wang, S. L. 2011. Emerging economy copycats: Capability, environment, and strategy. *Academy of Management Perspectives,* 25(2): 37–56.
Lüthje, C., Herstatt, C., & von Hippel, E. 2005. User-innovators and "local" information: The case of mountain biking. *Research Policy,* 34(6): 951–965.
Madhok, A., & Keyhani, M. 2012. Acquisitions as entrepreneurship: Asymmetries, opportunities, and the internationalization of multinationals from emerging economies. *Global Strategy Journal,* 2(1): 26–40.
March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science,* 2(1): 71–87.
McDermott, G. A., & Corredoira, R. A. 2010. Network composition, collaborative ties, and upgrading in emerging-market firms: Lessons from the Argentine autoparts sector. *Journal of International Business Studies,* 41(2): 308–329.
McDermott, G. A., Corredoira, R. A., & Kruse, G. 2009. Public-private institutions as catalysts of upgrading in emerging market societies. *Academy of Management Journal,* 52(6): 1270–1296.
McDermott, G. A., & Pietrobelli, C. 2017. Walking before you can run: The knowledge, networks, and institutions for emerging market SMEs. In T. Pedersen, T. M. Devinney, L. Tihanyi, & A. Camuffo (Eds.), *Breaking up the global value chain*: 311–332. Emerald: Bingley.
Meyer, K. E., Li, C., & Schotter, A. P. 2020. Managing the MNE subsidiary: Advancing a multi-level and dynamic research agenda. *Journal of International Business Studies,* 51(4): 538–576.
Miles, M. B., Huberman, A. M., & Saldaña, J. 2013. *Qualitative data analysis: A methods sourcebook* (3rd ed.). Thousand Oaks: Sage.
Minbaeva, D. B. 2007. Knowledge transfer in multinational corporations. *Management International Review,* 47(4): 567–593.
Monteiro, L. F. 2015. Selective attention and the initiation of the global knowledge-sourcing process in multinational corporations. *Journal of International Business Studies,* 46(5): 505–527.
Moran, P., & Ghoshal, S. 1999. Markets, firms, and the process of economic development. *Academy of Management Review,* 24(3): 390–412.
Morris, S. S., Zhong, B., & Makhija, M. 2015. Going the distance: The pros and cons of expanding employees' global knowledge reach. *Journal of International Business Studies,* 46 (5): 552–573.
Mudambi, R., & Swift, T. 2014. Knowing when to leap: Transitioning between exploitative and explorative R&D. *Strategic Management Journal,* 35(1): 126–145.
Murthy, R. K., & Madhok, A. 2021. Overcoming the Early-stage Conundrum of Digital Platform Ecosystem Emergence: A Problem-Solving Perspective. *Journal of Management Studies,* 58(7): 1899–1932.
Nickerson, J. A., Silverman, B. S., & Zenger, T. R. 2007. The "problem" of creating and capturing value. *Strategic Organization,* 5(3): 211–225.
Nickerson, J. A., & Zenger, T. R. 2004. A knowledge-based theory of the firm—The problem-solving perspective. *Organization Science,* 15(6): 617–632.
Oldroyd, J. B., Morris, S. S., & Dotson, J. P. 2019. Principles or templates? The antecedents and performance effects of cross-border knowledge transfer. *Strategic Management Journal,* 40 (13): 2191–2213.
Papanastassiou, M., Pearce, R., & Zanfei, A. 2020. Changing perspectives on the internationalization of R&D and innovation by multinational enterprises: A review of the literature. *Journal of International Business Studies,* 51(4): 623–664.
Parente, R., Melo, M., Andrews, D., Kumaraswamy, A., & Vasconcelos, F. 2021. Public sector organizations and agricultural catch-up dilemma in emerging markets: The orchestrating role of Embrapa in Brazil. *Journal of International Business Studies,* 52(4): 646–670.
Pavitt, K. 1984. Sectoral patterns of technical change: Towards a taxonomy and a theory. *Research Policy,* 13(6): 343–373.
Peng, M. W., Ahlstrom, D., Carraher, S. M., & Shi, W. S. 2017. An institution-based view of global IPR history. *Journal of International Business Studies,* 48(7): 893–907.
Peng, M. W., & Heath, P. S. 1996. The growth of the firm in planned economies in transition: Institutions, organizations, and strategic choice. *Academy of Management Review,* 21(2): 492–528.
Peng, M. W., Lebedev, S., Vlas, C. O., Wang, J. C., & Shay, J. S. 2018. The growth of the firm in (and out of) emerging economies. *Asia Pacific Journal of Management,* 35(4): 829–857.
Peng, M. W., & Luo, Y. 2000. Managerial ties and firm performance in a transition economy: The nature of a micro-macro link. *Academy of Management Journal,* 43(3): 486–501.

Perez-Aleman, P. 2011. Collective learning in global diffusion: Spreading quality standards in a developing country cluster. *Organization Science,* 22(1): 173–189.
Pietrobelli, C., & Rabellotti, R. 2011. Global value chains meet innovation systems: Are there learning opportunities for developing countries? *World Development,* 39(7): 1261–1269.
Pietrobelli, C., Rabellotti, R., & Aquilina, M. 2004. An empirical study of the determinants of self-employment in developing countries. *Journal of International Development,* 16(6): 803–820.
Prahalad, C. K., & Ramaswamy, V. 2004. Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing,* 18(3): 5–14.
Qiu, R., & Cantwell, J. 2018. The international geography of general purpose technologies (GPTs) and internationalisation of corporate technological innovation. *Industry and Innovation,* 25(1): 1–24.
Rosenkopf, L., & Nerkar, A. 2001. Beyond local search: boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal,* 22(4): 287–306.
Roth, E., Seong, J., & Woetzel, J. 2015. Gauging the strength of Chinese innovation.
Santos, J. F., & Williamson, P. J. 2015. The new mission for multinationals. *MIT Sloan Management Review,* 56(4): 45.
Saxenian, A. 2007. *The new argonauts: Regional advantage in a global economy*. Boston: Harvard University Press.
Schotter, A. P., Mudambi, R., Doz, Y. L., & Gaur, A. 2017. Boundary spanning in global organizations. *Journal of Management Studies,* 54(4): 403–421. This isn't mentioned in the text.
Schweisfurth, T. G. 2017. Comparing internal and external lead users as sources of innovation. *Research Policy,* 46(1): 238–248.
Shenkar, O. 2010. Copycats: How smart companies use imitation to gain a strategic edge. *Strategic Direction,* 26(10): 3–5.
Si, M. 2019. Apple has over 1,000 people in its four China R&D centres. http://www.eguiyang.com.cn/2019-05/27/content_37474280.htm. Accessed February 10, 2022.
Stevens, C. E., Xie, E., & Peng, M. W. 2016. Toward a legitimacy-based view of political risk: The case of Google and Yahoo in China. *Strategic Management Journal,* 37(5): 945–963.
Stuart, T. E., & Podolny, J. M. 1996. Local search and the evolution of technological capabilities. *Strategic Management Journal,* 17(S1): 21–38.
Szulanski, G., & Jensen, R. 2006. Presumptive adaptation and the effectiveness of knowledge transfer. *Strategic Management Journal,* 27(10): 937–957.
Tang, L., Murphree, M., & Breznitz, D. 2016. Structured uncertainty: A pilot study on innovation in China's mobile phone handset industry. *The Journal of Technology Transfer,* 41(5): 1168–1194.
Teece, D. J., Pisano, G., & Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal,* 18(7): 509–533.
The Economist. July 31, 2022. *Apple already sold everyone an iPhone.* Now what?
Urban, G. L., & von Hippel, E. 1988. Lead user analyses for the development of new industrial products. *Management Science,* 34(5): 569–582.
Utterback, J. M. 1994. Radical innovation and corporate regeneration. *Research Technology Management,* 37(4): 10.
Uzzi, B., & Lancaster, R. 2003. Relational embeddedness and learning: The case of bank loan managers and their clients. *Management Science,* 49(4): 383–399.
Verganti, R. 2009. *Design driven innovation: Changing the rules of competition by radically innovating what things mean*. Boston: Harvard Business Press.
Vernon, R. 1979. The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics,* 41(4): 255–267.
von Hippel, E. 1986. Lead users: A source of novel product concepts. *Management Science,* 32(7): 791–805.
von Hippel, E. 2005. Democratizing innovation: The evolving phenomenon of user innovation. *Journal Für Betriebswirtschaft,* 55(1): 63–78.
Yin, R. K. 2009. *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage.
Zhong, B., Makhija, M.V. and Morris, S., 2022. Abstract Versus Concrete: How Managers' Construal Influences Organizational Control Systems and Problem Solving. *Organization Science*, 33(6), 2322–2345.

APPENDIX

See Tables 4 and 5.

Table 4 Problem search—select interview data

	Customer interaction: **Who**	Customer interaction: **How**	
Pseudonym	Customer type	Contextual observation or formalized interaction	Overall label for customer interaction
Swallow	**Lead customers.** *Creating new-to-the-world products.* "We are doing cool innovations for customers, so new stuff, so previously not existing…. Sometimes it can be very difficult problems for others to do."	**Moderate.** *Co-innovation with customer to solve problems with existing products.* "[Customers will tell us] this user interface is not beautiful enough, this functionality unfortunately does not fit our process. And then you need to provide more customized possibilities."	**Moderate contextual interaction with lead customers**

Table 4 (*Continued*)

	Customer interaction: **Who**	Customer interaction: **How**	
Hawk	**Proximate customers.** *Valued proximate customers, including sending high-level executives to speak with and learn from them.*	**High.** *Visiting customer sites causes XXX to question the existing product design.* "[When you're at a factory, you ask], what's our product? How could you put that in the customer site?"	**Moderate contextual interaction with proximate customers**
Magpie	**Proximate customers.** *Projects consisted of modifications to existing global products.*	**High.** *Engineers occasionally visit a customer site and find that the customer is not using the product productively. They help modify the design for the customer's objective.* "The customer has a system, but our product cannot work well with the system. We went to the customer side and work[ed] with the supplier of their system to solve the problem…. Our engineers went there and found that it's not our fault, but we cannot just say no to customers. So we help the system suppliers to improve their system."	**Moderate contextual interaction with proximate customers**
Finch	**Proximate customers.** *Projects consisted of modifications to existing global products.*	**Moderate.** *Customer interaction is limited to persuading the customer to accept what the engineers can do.* "We try to persuade the customer or to understand what they really need…. It's just hard to persuade the customer to keep it." "We need to visit the customer to understand what's their real request. To check their spec one by one…. For example, this is ok and this is ok and this is maybe some challenge for us." "We will explain to them the value might not be there…. We can share with you our development experience and our expertise on this area."	**Low contextual formalized interaction with proximate customers**
Albatross	**Lead and proximate customers.** *Chinese and other Asian businesses requesting modifications to existing global products.*	**Low.** *Try to meet customer specs with slight modifications to existing resources.* "The engineering department never makes any decision in parameters. All comes from marketing department. The engineering manager will say if this parameter will be feasible…. If it is feasible, we will start project." "If, currently, we already have some models, we can say what can match already and some not match, we can make the modification."	**Formalized interaction with proximate customers**
Sparrow	**Proximate customers.** *Projects consisted of modifications to existing global products.*	**Low.** *They just do what they're told from HQ rather than actively work to innovate with customers.* "[People here] don't take the initiative to look up something, and in most cases, they [are] passively led by the Americans."	**Formalized interaction with proximate customers**

Table 5 Solution search—select interview data

	Partner interaction: **Who**	Partner interaction: **How**	
Pseudonym	Expert type	Principles or templates	Overall label for expert interaction
Swallow	**External experts.** *Contact with outside experts through the corporation's external networks, including engaging in a "complete development cycle" in which they work with multiple outsiders.*	**Principles.** *Focus on learning underlying knowledge when innovating.* "Find out what the point of the knowledge is. Dig in to make some creative ideas, …otherwise you just do what others have already done."	**Moderately principles-based learning with external experts**
Hawk	**Internal experts.** *Strong relations with experts at US HQ with frequent travel between. Emphasize frequent social interactions to facilitate natural communication.*	**Principles.** *Constantly tried to extract core principles from one group and apply them to another group. For example, turbo engine principles were used to improve clean air filtration systems.*	**Highly principles-based learning with internal experts**
Magpie	**Internal experts.** *Frequent web bag meetings with Swiss team; each team visits each other twice per year, and they often have engineer exchange programs.* "When we have problems, we ask for suggestions from the Swiss team."	**Principles.** "They are more experienced than us, so we go to them to ask whether they have already met such a problem and how they solved the problem. But you know, the conditions are different, the situations are different, so their solution is maybe not our solution…. So we just try to get underlying experience from them. We are not necessarily looking for a solution…. Because much of their know-how is not documented. It's in their brains."	**Highly principles-based learning with internal experts**
Finch	**Internal experts**. *Most projects are done in close collaboration with HQ experts in UK who have 20–30 years of experience.*	**Principles.** "Most of our [global collaboration] projects focus on understanding."	**Highly principles-based learning with internal experts**
Albatross	**Internal experts.** *Most engineer communication is limited to their location. International communications are handled by the manager when necessary.* "I will contact them only when my manager builds a relationship between me and other sites abroad."	**Templates.** *Knowledge search is for existing solutions.* "Maybe some technology is in China, and maybe someone in the US or UK has already done something like what we're trying to do." "We just send an email ask [ing] the R&D directors in each site if they have the technology and can they share with us? If they have already dev the tech, they just share."	**Templates-based learning with internal experts**
Sparrow	**Internal experts.** *Most communications are unidirectional requests from the Americans. Though some engineers travel to the US, it isn't very effective.* "We send staff members to the US, hoping they will bring back some new ideas. But some members sent there are plodders (a willing ox). They just do their job and rarely place interest on other things."	**Templates**. *They modify customer's existing IT systems according to the specs sent from the American team.*	**Templates-based learning with internal experts**

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