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Knowledge acquisition and firm competitiveness: the role of complements and knowledge source

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Abstract

Purpose – This paper aims to propose positive and negative firm competitiveness effects of knowledge acquisition of pertinent, irrelevant and erroneous knowledge based on its distinctiveness, the source of knowledge and the presence of firm complements.

Design/methodology/approach – Aspects of knowledge acquisition from the innovation, knowledge and routines literatures are integrated to create propositions showing the effects of knowledge acquisition on firm competitiveness. Examples from different eras of the automobile industry are used to illustrate the propositions and demonstrate the enduring nature of these issues.

Findings – Various combinations of firm complements and knowledge type and criticality can cause significant competitive effects, such as parity, relative harm and opportunity capture, that managers should be cognizant of when planning knowledge acquisition.

Research limitations/implications – Knowledge researchers should use a more integrative, holistic approach concerning firm resources to their empirical studies. This better allows for the competitive effects of interactions between new and existing firm resources to be captured.

Practical implications – The propositions emphasize the importance of increased managerial attention and understanding of potential problems of new knowledge acquisition. Moreover, managers should pay particular attention to their firm's existing complements when assessing knowledge acquisition benefits.

Originality/value – The positive value of firm knowledge receives substantially more research attention than the potential negative effects. This paper identifies the competitiveness effects of acquiring pertinent, irrelevant or erroneous knowledge. Increased attention on the interaction of new knowledge and complements illustrates the positive and negative effects on firms.

Keywords Competitiveness, Innovation, Knowledge management, Knowledge acquisition, Imitation, Complements

Paper type Conceptual paper

Introduction

New knowledge is critical to firms (Bolisani and Bratianu, 2017); they can benefit from integrating new knowledge with existing firm knowledge (Cohen and Levinthal, 1990). This enables a firm to advance more quickly and effectively than its competitors via exploration and exploitation (Levinthal and March, 1993; Rosenkopf and Nerkar, 2001), but the application of knowledge can be costly or deleterious if it is irrelevant or erroneous. Acquiring and using new knowledge is important so the firm benefits from new understandings. However, what if those understandings are incorrect? What if the new knowledge is actually flawed or inappropriate for the firm's context? A firm can be damaged by implementing action based on flawed knowledge. For example, Bear Sterns, Lehman Brothers, Merrill Lynch and other Wall Street firms filled their portfolios with mortgage-backed securities that they erroneously thought were sufficiently safe

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(Gilad, 2011). Knowledge of these securities was problematic, which became evident when market conditions changed causing significant damage to the industry and economy.

Knowledge management should play a key role in business strategy (Heisig *et al.*, 2016), but many firms have difficulty in implementing it effectively (Dayan *et al.*, 2017). New knowledge can lead to synergies with existing knowledge (and capabilities). Complements are dependent on, used with, strengthen and increase the value of other capabilities (Cassiman and Valentini, 2016; Rothaermel, 2001; Rothaermel and Hill, 2005; Teece, 1986; Tripsas, 1997; Van Der Vegt *et al.*, 2010). Thus, *complements* are defined here as elements of a firm such as assets, capabilities, activities, and products, that intensify the impact of another firm element. This means that the positive potential of a firm element can produce greater positive outcomes when more and better complements are present (the presence of complements, as used throughout this paper for conciseness, infers more and better complements relative to fewer and worse, rather than a binary distinction of complements or no complements). It also means that the negative potential of a firm element can produce greater negative outcomes when complements exist.

What if the new knowledge is not critical (i.e. irrelevant or erroneous)? Firms face knowledge application costs and can be damaged by new, non-critical knowledge as it gets used. However, if there are complements, the non-critical knowledge can cause *significantly greater* damage because the knowledge may become integrated into firm actions as significant interdependencies are created (Dosi *et al.*, 2008). If this occurs, the actions may stop providing previous benefits and start creating detriments. Thus, there is potential that new, non-critical knowledge erodes the firm's competitive advantage and solidifies this weaker state as it guides firm actions.

Firms that do not acquire new knowledge are not exposed to its beneficial properties (Floyd and Lane, 2000) if it is pertinent, nor its detrimental properties if it is irrelevant or erroneous. However, these firms may still face a relative change in competitiveness if competitors acquire the knowledge. To conceptually investigate these situations, the innovation, knowledge-based view (KBV), and routines literatures are examined to identify important concepts that are instrumental to this phenomena. Next, a set of propositions is developed, using the global automobile industry as a backdrop, to illustrate the beneficial and detrimental competitive outcomes that stem from each combination of knowledge criticality, knowledge uniqueness, and presence of firm complements. Finally, managerial and research implications are discussed.

Imitation and innovation in the competitive environment

Firms develop and manage critical resources, such as knowledge, that create capabilities the firm can utilize to try to outperform competitors (Dosi *et al.*, 2008) (throughout the manuscript it is implied that knowledge and other resources are the basis for capabilities). Resource importance differs between industries (Spender, 1989) and within industries (Porter, 1985). While engaging in advantage-seeking activities, firms must also consider that some less important activities must be maintained. Thus, highly competitive firms know when to excel at some important activities while maintaining minimally acceptable levels on other activities (Deepphouse, 1999). For example, a firm may focus on technologically advanced products while keeping product quality high enough to not be a customer-perceived detriment, while a competitor may focus on achieving tremendous quality while still providing basic technological features in demand.

Firms sustain advantage by limiting competitor imitation (Barney, 1991). Competitors facing disadvantage will attempt to imitate the resource or innovate. Due to resource limitations, a firm's strategy likely includes being partly similar to direct competitors to avoid disadvantage, but also being different to create advantage (Deepphouse, 1999). Imitation,

which can stem from observing competitor actions (Haunschild and Miner, 1997), creates parity by providing firms with similar resources (Chen, 1996) that enable them to engage in similar knowledge application activities such as product and process enhancements and cost reduction efforts. Thus, imitation efforts decrease distinctiveness as a firm relies on competitor actions as the external knowledge source to guide its own actions. Innovation, on the other hand, is aimed at distinctiveness of resources and capabilities that enable competitively dissimilar knowledge applications. These unique activities are the basis for differential opportunity capture and harm stemming from increased uncertainty (Brown and Eisenhardt, 1997). Thus, innovation efforts result in greater distinctiveness as a firm relies on the external environment (not including competitors) as the external knowledge source for inspiration for its own actions. Figure 1 illustrates the connection between knowledge source and the imitation vs. innovation designation. Imitation is based on competitor action as the primary external knowledge source, while innovation is based primarily on the external environment (not including competitors).

Figure 1 also shows a distinction between incremental and radical imitation and innovation based on the existence of firm complements. Complements were previously defined as elements of a firm such as assets, capabilities, activities and products that intensify the impact of another firm element. The logic for using the existence of complements as indicators of whether imitation or innovation is incremental or radical stems from the degree of difference between what a firm is already doing, and what a firm does in the future with incremental referring to smaller changes and radical referring to larger changes. Innovation has often been categorized as incremental or radical (although a continuum likely exists). *Incremental innovation* “entails the refinement and reinforcement of existing products, processes, technologies, organizational structure and methods” (Forés and Camisón, 2016, p. 833), while *radical innovation* “is that which produces fundamental changes in the firm’s products, processes, technologies, and organizational structure and methods” (Forés and Camisón, 2016, p. 833). These definitions express the variety of innovation types, such as technological, process, and management (Ghemawat and Hout, 2008; Wu *et al.*, 2017), which affects the definition of innovation applicable to the logic proposed here. Product-focused innovation may be measured by comparing new products to prior products, while a broader innovation definition includes technological, process, and management innovations that demonstrate a change in what firms do, and not just product changes.

Innovation is generated by new combinations of internal and external knowledge, while imitation focuses on copying current practices. This copying effort varies in size and effort depending, in part, on existing capabilities (e.g. complements). Thus, a broad view of imitation would mean that the same imitation effort could be incremental for one firm and radical for another. The literature lacks in describing imitation in this way. However, this view takes into account that firms differ in their resource set (which matters to both innovation and imitation efforts). Thus, in building off of the aforementioned definitions of innovation by

Figure 1 Types of imitation and innovation based on external knowledge source and the presence of firm complements

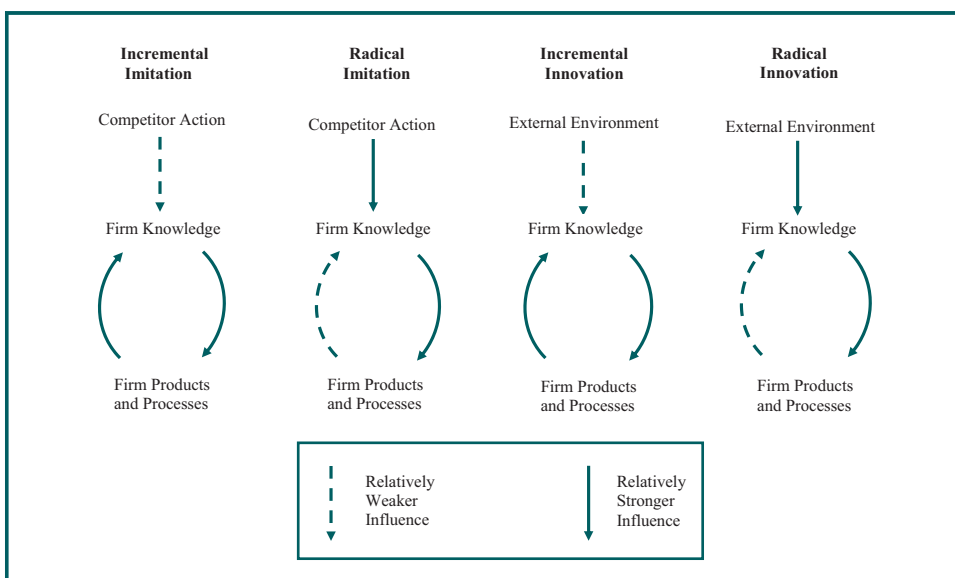
Complements	Yes	Incremental Imitation	Incremental Innovation
	No	Radical Imitation	Radical Innovation
		Competitor Action	External Environment
		External Knowledge Source	

Forés and Camisón (2016), *incremental imitation* involves the refinement and reinforcement of existing products, processes, technologies, organizational structure and methods to mimic other firms, while *radical imitation* involves fundamental changes in the firm's products, processes, technologies, and organizational structure and methods to mimic other firms. Figure 1 illustrates this categorization by connecting the existence or absence of complements with the source of external knowledge.

Radical innovation can enhance competitiveness by, for instance, increasing customer value and decreasing costs (Leifer *et al.*, 2000). Succeeding at radical innovation can be more difficult than incremental innovation (Story *et al.*, 2014), because using different resources including knowledge creates uncertainty that increases mistakes and hesitation as firms attempt to productively identify and engage in new activities (Chandy and Tellis, 1998). Incremental innovation, due to the existence of complements, can have a strong element of path dependency which can provide uniqueness when competitors do not possess similar complements.

Figure 2 portrays the process of incremental and radical imitation and innovation within a firm. A firm gains knowledge from a competitor's action (imitation) or the external environment (innovation) and from its own engagement of processes and products. This knowledge is then applied to products and processes. In the case of incremental imitation and innovation, new knowledge from a competitor action or the external environment plays a relatively smaller role than does the firm's products and processes in shaping the knowledge of the firm. In the case of radical imitation and innovation, new knowledge from a competitor action or the external environment plays a relatively larger role than do the firm's products and processes in shaping firm knowledge. Thus, incremental imitation and innovation maintain a more stable trajectory for the firm compared to radical imitation and innovation because existing firm knowledge is more likely to inform future firm knowledge with relatively less interference from competitor actions or new external knowledge. Although this can provide consistency and stability, it lacks the benefits of a strong strategic learning approach whereby a new strategic path can proactively be formed that enhances novelty, and potentially short-term risk (Sirén *et al.*, 2017).

Figure 2 A process model of the role of internal and external knowledge in incremental and radical imitation and innovation



Incremental innovation creates slightly-enhanced, existing knowledge resources that extend current firm processes and products. Existing organizational routines are often still useful in this case, because they use current skills in a stable manner (Nelson and Winter, 1982). Radical innovation is unlikely to rely on existing firm complements to the same degree as is incremental innovation. Moreover, integration of new innovations with existing firm complements can have positive *and* negative effects. Synergistic benefits accrue when a firm extends the competitive potential of complements by, for example, enhancing valuable product attributes. Synergistic detriments occur when an innovation negates a complement's value (or turns it into a negative). An example of this is when a firm creates a new manufacturing process that is integrated into a large automated factory and the process ends up causing production delays or quality problems with pre-existing product lines. Thus, resources, such as knowledge, can negatively impact the firm (Montgomery, 1995; Mosakowski, 2002; Wu *et al.*, 2017).

Knowledge-based view of the firm

Two key purposes of knowledge acquisition are imitation and innovation (Forés and Camisón, 2016; Giarratana and Mariani, 2014), thus firm knowledge facilitates competitiveness. Regarding knowledge, Mark Twain, the author and humorist, said, "It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so." From a firm competitiveness perspective, the first half of this saying suggests that a lack of knowledge could cause a firm to miss an opportunity, but it could still remain viable depending on whether competitors gain the knowledge or not. The second half of the saying suggests that harm can come from knowledge that is erroneous or irrelevant to the firm's current situation. The saying also exemplifies an element of the KBV whereby knowledge is a resource that can provide a competitive advantage. As an extension of the resource-based view (RBV), the KBV explains how firm knowledge leads to sustainable competitive advantage (Grant, 1996). As a critical resource, knowledge must be managed to effectively obtain its benefits. Through exploration and exploitation efforts, firms can create, access, transfer, use, store, and protect knowledge (Bloodgood *et al.*, 2013). Thus, it can be inferred that knowledge is *not always* useful. Knowledge, when applied incorrectly or used in invalid contexts, can be detrimental. Moreover, original new knowledge can be incomprehensible as there is no knowledge structure to make sense of it (Boisot, 1995). Thus, there is a strong potential for firms to use knowledge in a flawed manner at times and to incompletely acquire valuable new knowledge, leading to poor performance.

Knowledge use is not the only issue. Knowledge acquisition carries opportunity costs (e.g. managerial awareness (Wu, 2013)). Time, money and people are expended on acquiring a particular type of knowledge. These expenditures could be spent on other needs including other knowledge resources. Thus, it is important to examine firm capabilities once they do or do not acquire a particular knowledge resource. This is consistent with prior research on branding with respect to product features and their potential to enhance brand success. For example, Aufreiter *et al.* (2003) contrasted product attribute relevance and differentiation to categorize the role product features play in branding. They identified four types (Neutrals, Fool's Gold, Antes and Drivers) that have differential effects. Comparing this to knowledge acquisition, similarities in the potential of knowledge characteristics (e.g. distinctiveness and criticality) cause differential effects for competitors depending on the presence of complements can be seen.

Organizational learning

Attempts to be similar or different both require the ability to learn; an ability that likely differs among competitors (Verreynne *et al.*, 2016). Firms superior at learning develop knowledge that enhances decision making and implementation (Salmador and Florín, 2013). A process-based view of organizational learning includes the four sub-processes of

information acquisition, information distribution, information interpretation, and organizational memory (Thomas and Vohra, 2015). As the initial sub-process, information acquisition can significantly influence other sub-processes. Not all information and knowledge is accurate or valuable in the sense that it may be obsolete, ungeneralizable, fabricated, or incomplete via loss over time (Massingham, 2018). Some knowledge may not be generalizable because of context differences, which alters its usefulness among firms (Cruz-González et al., 2014). What may appear to be useful knowledge in its current context may be useless or even detrimental in another context (Miner et al., 2008). Thus, accurately gauging the applicability of new information for another context is critical.

Firms are concerned with competitive imitation (Chen, 1996). This is assessed by evaluating firm and competitor resources, and can be ineffectual at times (Bloodgood and Bauerschmidt, 2002). Knowledge identification skills vary among firms (Ortiz et al., 2018). Furthermore, a variety of conditions, such as differences in market position and complements, cause firms to value resources, including knowledge, differently (Schmidt and Keil, 2013). Due to the presence of complements, resource value varies among firms. For example, one firm may possess a high degree of automation in its production facilities while its competitor does manufacturing by hand. Computer software enhancements may help the automated firm much more than its competitor who may benefit more from specially-trained craftsmen. Perceived resource value within a firm can vary among members, which can inhibit the integration of some resources, including knowledge, with prior resources. Emerging routines may be a good avenue for managing these situations as their regulating mechanisms, such as splicing, activating, and repressing (Salvato and Rerup, 2018), function to unite differing positions.

Organizational routines

An organizational routine is “an executable *capability* for repeated performance in some *context* that has been *learned* by an organization in response to *selective pressure*” (Cohen et al., 1996, p. 683). Organizational routines include human actors and artefacts (Pentland et al., 2012), and indicate stored organizational learning and knowledge (Hodgson, 2008) that can enable and constrain organizational actions (Burns and Scapens, 2008; Ventresca and Kaghan, 2008). Routines can be designed and operated deliberately or emergently (Cohendet and Llerena, 2008; Miner et al., 2008), and they typically develop from the exercise of firm behaviors that are perceived as satisfactory. These behaviors are subsequently repeated, and if frequently engaged, become routinized and more automatic over time (Knudsen, 2008; Nelson and Winter, 1982). Routines are thought to be based more on satisfactory behaviors rather than optimal behaviors as they require less complex, involved search. Moreover, the selection of routines during search is influenced by non-economic factors such as politics (Nigam et al., 2016). Routines can be sources of stability and change (Schulz, 2008). New knowledge that is accessed by the firm, through search for example (Greve, 2008), can either become absorbed into routines or it can disrupt routines and prompt new or modified behaviors. This paper asserts that the more that new knowledge is consistent with existing firm knowledge (e.g. complements), the less disruptive it will be to existing routines. This is due to the new knowledge preserving the routine’s stability via relatively consistent priming that maintains reciprocal triggering of actions in the routine (Schulz, 2008), with the result of the new knowledge becoming integrated into the routine as part of the generative process of the routine (Dosi et al., 2008). The new knowledge will then *support* and *intensify* the trajectory of existing routines (whether beneficial or detrimental).

Although routines can help competitiveness, through enhanced coordination, efficiency, and effectiveness (Cohendet and Llerena, 2008), they can create ambiguity due to their incomplete observability that stems from their relatively mindless and distributed enactment (Dosi et al., 2008; Pentland and Feldman, 2008; Schulz, 2008). Two types of resource

ambiguity, linkage (relationship to firm performance) and characteristic (nature and function), cause particular problems (King and Zeithaml, 2001). Performance enhancement efforts may increase ambiguity as routines are modified, both formally and informally, based on the extent of change attempted (Greve, 2008). Intentional changes, accidents and luck can introduce variation into a routine (Pentland *et al.*, 2012). The combination of these factors reduces firm members' ability to fully and accurately know a routine and its role in competitive advantage (Nelson and Winter, 1982). This ambiguity about the knowledge represented by a routine makes it difficult to evaluate potential integration with complements, and the full extent of their interdependencies (Dosi *et al.*, 2008). Thus, if attempts to integrate irrelevant or erroneous knowledge are made, managers may be unable to accurately predict outcomes on the firm's routines and competitiveness. This effect is consistent with prior research that identified managers' inability to accurately compare their firms' and direct competitors' capabilities (Bloodgood and Bauerschmidt, 2002). This highlights the need for organizations to be able to know the context in which a routine developed (Cohendet and Llerena, 2008), and to have the capacity to unlearn routines (Kluge and Gronau, 2018; Lazaric, 2008). Researchers are making advances in our understanding of unlearning processes of organizational routines (Fiol and O'Connor, 2017a, 2017b).

Propositions

Conclusions drawn from the literatures above include the tendency for radical imitation (without complements) to lead to increased competitive parity (common opportunity capture or harm) because of a lack of knowledge distinctiveness among competitors, while radical innovation (without complements) is more likely to lead to competitive advantages (opportunity capture) or disadvantages (harm) because of increased knowledge distinctiveness among competitors.

To the extent that incremental imitation is associated with complements, there may be complement-based advantage (unique opportunity capture) and disadvantage (unique harm) rather than parity because of the integration with complements. Similarly, to the extent that incremental innovation is associated with complements, there may be an increased likelihood that knowledge acquisition efforts will lead to enhanced advantages (unique opportunity capture) or extreme disadvantages (unique harm) as the complements provide for positive and negative synergies between the new knowledge and existing knowledge. These synergies contribute to the uniqueness of the potential opportunity capture and harm because of the idiosyncratic nature of the integration. Moreover, to the extent that some of an organization's knowledge is in the form of routines, the organization can develop a disposition toward applying the knowledge (Knudsen, 2008), thereby causing the knowledge to become more pervasive and influential.

Radical innovation may, at times, be more challenging to accomplish than incremental innovation because of the greater newness, but once accomplished its lack of integration with complements means less synergies are available. The lack of synergies dampens the potential opportunity capture and harm of the innovation because other areas of the firm are relatively less affected. Incremental innovation, on the other hand, is tied more closely to complements which, at times, makes it less difficult to achieve, but once accomplished the integration provides opportunities for synergies in the form of unique opportunity capture and harm.

Two terms established by Nag and Gioia (2012) are particularly appropriate here. The first term is *knowledge criticality* which refers to when greater value is ascribed to knowledge. This primarily stems from the knowledge being applicable and useful in a particular context. The second term is *knowledge distinctiveness* which refers to the degree to which knowledge can be acquired or emulated by others. Consistent with the KBV, when knowledge is critical and distinctive it can lead to the rare application of knowledge that

results in competitive advantage. Although knowledge distinctiveness has received significant attention by researchers, knowledge criticality has primarily been implicitly acknowledged. Within the KBV, knowledge can be viewed as important in a particular context. With the notion of knowledge criticality, differences between three types of criticality can be discerned. When knowledge has high criticality, being important and valuable, it can be referred to as *pertinent*. Knowledge that is wrong is considered to be of low criticality, and can be referred to as *erroneous*. Knowledge that is simply not applicable or useful can be referred to as *irrelevant*.

Taken together, the issues of knowledge criticality and knowledge distinctiveness can be used to construct two matrices of knowledge acquisition outcomes for a firm (assuming the knowledge is applied if obtained). One matrix (Figure 3) illustrates the competitive outcomes based on the focal firm's acquisition of the knowledge with no complements present and the other matrix (Figure 4) illustrates the competitive outcomes with complements present. Figures 3 and 4 each have a vertical axis representing levels of knowledge distinctiveness (low and high) and a horizontal axis representing types (erroneous, irrelevant, and pertinent) of knowledge criticality. Taken together, these matrices identify the proposed effects of competitive advantage and disadvantage for each scenario.

Figures 3 and 4 can be used to identify the set of propositions presented below. A key assertion, shown in Figures 3 and 4 is the connection between complements and imitation. When a firm with complements imitates or innovates it builds on existing knowledge, resulting in incremental change from the firm's perspective. The change is more of a refinement or extension of previous actions. In the case of incremental imitation, the firm is mimicking another firm while continuing the trajectory of its prior actions. In the case of

Figure 3 Competitive advantage effects of focal firm's knowledge acquisition with no relative firm complements present

New Knowledge Distinctiveness	High	<u>Radical Innovation</u> Disadvantage via Unique Harm	<u>Radical Innovation</u> Minor Disadvantage via Unique Harm	<u>Radical Innovation</u> Advantage via Unique Opportunity Capture
	Low	<u>Radical Imitation</u> Parity via Common Harm	<u>Radical Imitation</u> Parity via Minor Common Harm	<u>Radical Imitation</u> Parity via Common Opportunity Capture
		Erroneous	Irrelevant	Pertinent
		New Knowledge Criticality Type		

Figure 4 Competitive advantage effects of focal firm's knowledge acquisition with relative firm complements present

New Knowledge Distinctiveness	High	<u>Incremental Innovation</u> Extreme Disadvantage via Unique Harm	<u>Incremental Innovation</u> Disadvantage via Unique Harm	<u>Incremental Innovation</u> Enhanced Advantage via Unique Opportunity Capture
	Low	<u>Incremental Imitation</u> Disadvantage via Unique Harm	<u>Incremental Imitation</u> Minor Disadvantage via Unique Harm	<u>Incremental Imitation</u> Advantage via Unique Opportunity Capture
		Erroneous	Irrelevant	Pertinent
		New Knowledge Criticality Type		

incremental innovation, the firm is creating something different from competitors, while continuing its current trajectory. Alternatively, when complements are not present, the firm is engaging in imitation or innovation that is radical for the firm. Its actions are not based on refinement or extension of its previous actions, but rather it changes trajectory. Incremental and innovative attempts at imitation and innovation can result in opportunity capture or harm based on the type of knowledge criticality. In addition, the degree of benefits and drawbacks from these efforts are based on knowledge distinctiveness. The specific type of competitive outcome depends on the combination of degree of knowledge distinctiveness and type of knowledge criticality. Although these outcomes are delineated in more detail below, in general, the outcomes of competitive advantage and disadvantage accrue from the reliance on pertinent and erroneous high distinctiveness knowledge. When the knowledge is irrelevant and highly distinctive, it results in minor disadvantage primarily stemming from the unique costs a firm faces in applying it, with little additional damage. When knowledge has low distinctiveness, it results in parity from multiple competitors using it with opportunity capture, minor common harm and common harm occurring based on the degree to which the knowledge is pertinent, irrelevant and erroneous, respectively.

When a firm has complements, competitive outcomes from new knowledge acquisition change. Complements intensify advantages and disadvantages, and turn potential parity into advantages and disadvantages. With high distinctiveness knowledge, the advantage of pertinent knowledge is enhanced over that found with no complements because the complements enable additional leverage of the benefits. The same is true for erroneous knowledge, except in a negative way, because the erroneous knowledge is leveraged and makes the disadvantage more extreme. If the knowledge is irrelevant, the outcome moves from minor disadvantage to disadvantage because knowledge application costs are greater when integrating the knowledge with the complements. When knowledge distinctiveness is low, the parity that was present when competing firms had no complements changes to advantage, minor disadvantage, and disadvantage based on whether the knowledge type is pertinent, irrelevant, or erroneous, respectively. These changes occur because even though the knowledge is common, the presence of firm complements causes any common benefits from pertinent knowledge to be leveraged beyond that of competitors without similar complements, causes minor common harm from irrelevant knowledge to be leveraged and become a minor disadvantage from unique harm, and causes common harm from erroneous knowledge to become a disadvantage from unique harm because the knowledge is leveraged to a greater extent than that found with competitors without complements.

To the extent that organizations attempt to enhance their knowledge to engage in more beneficial activities, the *Opportunity Capture* quadrant (top right of Figures 3 and 4) is the most sought after. In these cells knowledge criticality is pertinent and distinctiveness is high. The integration and application of this distinctive knowledge results in unique opportunity capture that results in competitive advantage via radical innovation (Figure 3), but if the firm possesses complements it can result in even greater unique opportunities that lead to enhanced competitive disadvantage via incremental innovation (Figure 4). Although it may be (erroneously) thought that new innovations that are not tied to existing product, technological, or organizational knowledge offer the greatest chance for advantage based on their newness, the existence of complements provides the opportunity for leverage, faster introduction, and a greater potential for sustainability due to the linkages with complements that competitors do not have.

To illustrate these posited relationships the examples of Mazda's new engine technology and Toyota's advancement in Hybrid technology can be used. Mazda came out with a set of engine improvements (pertinent knowledge) it terms Skyactiv-X (Mazda, 2017). These unique improvements (high distinctiveness knowledge) are based on a new technology called Spark Controlled Compression Ignition (SCCI) and include the use of higher

compression and a leaner fuel-air mix. This innovation is radical rather than incremental because it relied on brand new technologies that were not primarily associated with existing competencies (i.e. lack of complements) and other competitors were not doing it. Mazda expects to see an improvement in gas mileage and torque along with decreased pollution from its engines using this technology. These benefits can increase demand for vehicles with these engines, and provide additional ways for Mazda to meet government-imposed industry regulations. Thus, these benefits provide Mazda an advantage from unique opportunity capture.

Toyota, on the other hand, built off its technology and market advantages with hybrid vehicles (complements) by introducing new hybrid designs (pertinent and high distinctiveness knowledge) and models that complemented its original Prius. The Prius c and Prius v expanded Toyota's hybrid presence (as did the use of hybrid engines in existing conventional vehicles)[1]. This innovation is considered incremental because it focused on extending the existing trajectory of Toyota. The unique and important, sizable presence of hybrid automobiles at Toyota enhances the legitimacy of the technology to consumers. With expected increased sales volumes, increased economies of scale should enhance Toyota's unique cost advantage beyond that available to competitors who do not have complements such as existing high-volume hybrid production. Thus, these new hybrid designs provide Toyota with enhanced advantage from unique opportunity capture:

- P1. Firms engaging in radical innovation by acquiring highly distinctive and pertinent knowledge can gain competitive advantage through unique opportunity capture.
- P2. Firms with relative complements engaging in incremental innovation that acquire highly distinctive and pertinent knowledge can gain enhanced competitive advantage through unique opportunity capture.

Firms should, on the other hand, attempt to avoid obtaining knowledge that has erroneous knowledge criticality and high distinctiveness. The *Unique Harm* cells (top left of Figures 3 and 4) illustrate that when knowledge is erroneous and highly distinctive, it can result in unique harm that leads to competitive disadvantage via radical innovation (Figure 3). If, on the other hand, the organization acquires this knowledge while possessing complements, it can result in unique harm that leads to extreme competitive disadvantage via incremental innovation (Figure 4). Similar to the greater positive impact of incremental over radical innovation on opportunity capture described in P1 and P2, a greater negative impact can occur through greater leverage and faster, more comprehensive integration and introduction of incremental innovations due to the linkages with complements that competitors do not possess.

To illustrate these posited relationships the examples of Mazda's rotary engine introduction and Ford's use of direct (DC) electrical current rather than alternating current (AC) in its infamous Rouge manufacturing complex can be used. Rotary engines from Mazda were significantly new and different (high distinctiveness) from its own (no complements) and other automakers' piston engines. The technology had the promise of higher revving and of greater horsepower per liter, providing a more exhilarating driving experience. However, the technology led to high oil consumption and disappointing gas mileage, along with low reliability[2] compared to its piston-driven engines (erroneous knowledge). The rotary engine application quickly became very limited, leaving Mazda with extensive upfront research costs, tooling installations, and little benefit. Thus, this technology provided Mazda with a disadvantage stemming from unique harm.

Consistent with Ford's position on the use of DC in its other manufacturing plants (complements), Ford used it in its massive Rouge manufacturing complex in the 1920s (Rubenstein, 2001). DC was designed to reduce safety hazards from the more potent AC that other manufacturers used. Unfortunately, the comprehensive use of DC at the Rouge complex (erroneous and high distinctiveness knowledge) resulted in significant power loss

and failure rates, as compared to AC, and had to be abandoned. This resulted in significant costs (US\$30m) and disruptions to convert back to AC that other manufacturers did not have to face. Thus, the DC design used by Ford resulted in an extreme disadvantage arising from unique harm:

P3. Firms engaging in radical innovation by acquiring highly distinctive and erroneous knowledge can face competitive disadvantage through unique harm.

P4. Firms with relative complements engaging in incremental innovation that acquire highly distinctive and erroneous knowledge can face extreme competitive disadvantage through unique harm.

It does not make a lot of rational sense for firms to acquire and use knowledge that is erroneous and has low distinctiveness as there is no way to benefit from it. The *Common Harm* quadrant (bottom left of Figure 3), illustrates that when a firm acquires erroneous knowledge, with no complements, that its competitors possess, it can lead to parity by causing common harm via radical imitation. The simultaneous possession of the knowledge does not cause additional harm as there are no complements. However, if a firm possesses complements (bottom left of Figure 4) it can face unique harm stemming from integrated use with the complements that leads to competitive disadvantage via incremental imitation. The imitation is incremental because the knowledge is associated with existing complements.

To illustrate these posited relationships examples concerning advanced electronics and communication devices, and the Ford Explorer can be used. The continuing inclusion of advanced electronics and communication devices in motor vehicles is designed to enhance vehicle capability and consumer product experience. A myriad of non-integrated technology-driven devices, such as lane departure warnings, tire pressure monitoring, and active cruise control, are rapidly being installed in vehicles (not complements). Although these devices are sought after by consumers, they often create reliability issues for the vehicles that have them[3][4][5]. Increased quantity and complexity create opportunities for system failure (erroneous knowledge) that cause consumer dissatisfaction. As one firm installs a new device, others quickly follow (low distinctiveness knowledge) before thorough analysis is done to eliminate malfunctions. Thus, many automakers are subject to consumers' hesitation to purchase vehicles with the newest technology. Thus, these technologies have provided automotive manufacturers with parity in the form of common harm.

Ford, on the other hand, faced a more unique problem with its introduction of the Explorer SUV in 1990. There was a strong desire by automakers to capture the burgeoning demand for SUVs in the late 1980s. Some of these SUVs were created by adding a passenger compartment on top of a small pickup truck underbody, as Ford did (low distinctiveness). Even though this was a low-cost solution, the high center of gravity increased rollover risk (erroneous knowledge). Ford thought they had a smart solution that used the Ford Ranger small pickup as the basis for the Explorer, which provided many benefits including existing production lines and use of existing parts (complements). This compounded the problem as carryover parts, such as the tires, were not designed to handle the needs of the heavier SUV[6]. The infamous Explorer/Firestone tire failure induced rollover debacle, killing hundreds of people and significantly damaging Ford and Firestone's reputations, demonstrated the intensified impact of using this type of SUV design with an existing vehicle such as the Ranger. Thus, the Explorer provided Ford with a disadvantage stemming from unique harm:

P5. Firms engaging in radical imitation by acquiring low distinctive and erroneous knowledge can achieve competitive parity through common harm.

P6. Firms with complements engaging in incremental imitation that acquire low distinctive and erroneous knowledge can face competitive disadvantage through unique harm.

If pertinent knowledge that is low in distinctiveness is acquired via radical imitation, a firm can expect to achieve parity because both it and its competitors are able to capture similar opportunities. This is shown in the *common opportunity capture* cell (bottom right of Figure 3). In this situation, the firm and its competitors achieve parity because both can integrate the beneficial knowledge into their strategic actions in a similar manner. However, if a firm possesses complements (bottom right of Figure 4) using incremental imitation it can gain a competitive advantage by capturing unique opportunities beyond those achieved by its competitors.

To illustrate these posited relationships, examples of the recent introduction of small turbo engines and battery technology improvements can be used. Recently, many automakers have tried to increase the power and gas mileage of their vehicles by replacing medium-sized (e.g. 2.0-2.5 liter) engines with smaller (1.5 liter) turbo-powered ones (not a complement) in a variety of vehicle types (low distinctiveness knowledge). The smaller size helps reduce fuel usage while the turbo offers enhanced acceleration when desired (pertinent knowledge). Advancements include reduced turbo lag, and the use of aluminum compressors[7]. Many firms are now copying one another throughout much of their product lines. This has increased overall consumer interest, but has not provided a unique advantage for any particular firm. Thus, small turbo engines have provided automotive manufacturers with parity in the form of common opportunity capture.

Battery technology advancements, on the other hand, have the potential to uniquely help firms possessing complements because of the benefits of economies of scale and customer relationships that involve research and development for electric vehicles. Some of the more established battery makers can copy newer firms' technology (low distinctiveness knowledge) because they already have significant related knowledge they can leverage. These established firms can then supply these technologically-advanced batteries (pertinent knowledge) in higher volumes because of closer knowledge of the automakers. China's largest battery maker, BYD, has the added benefit of building cars and buses that could use the batteries they are building[8] (complement). This provides BYD with the ability to directly assess battery applications and improve performance (e.g. quality, system design). Even though Japanese firms, such as Panasonic, the world's largest supplier of electric vehicle batteries⁸, grew large initially, China has tremendous plans to grow battery capacity. BYD and Panasonic are two of the key vendors in the electric vehicle battery market[9]. BYD will uniquely benefit from this focus because it can more easily integrate the battery and automobile technology for optimization of cost and performance. Thus, new battery technologies provide BYD with an advantage in the form of unique opportunity capture:

- P7. Firms engaging in radical imitation by acquiring low distinctive and pertinent knowledge can achieve competitive parity through common opportunity capture.
- P8. Firms with complements engaging in incremental imitation that acquire low distinctive and pertinent knowledge can gain competitive advantage through unique opportunity capture.

While the above propositions present potential competitive outcomes from the use of pertinent or erroneous knowledge, there are competitive outcomes, albeit less sizable, from the acquisition of irrelevant knowledge. These outcomes are primarily negative because of the costs involved in their acquisition and use, but are less detrimental than the outcomes associated with erroneous knowledge because irrelevant knowledge is relatively less impactful on the direction of the firm.

Firms should attempt to avoid obtaining knowledge that is irrelevant and highly distinctiveness. The *Unique Harm* cells (top middle of Figures 3 and 4) illustrate that when knowledge is irrelevant and highly distinctive, it can result in unique harm that leads to minor competitive disadvantage via radical innovation (Figure 3). If, on the other hand, the organization acquires

this knowledge while possessing complements, it can result in unique harm that leads to competitive disadvantage via incremental innovation (Figure 4). These negative impacts are caused by the cost to firms of acquiring the knowledge, relative to firms that do not, but are not as sizable as those associated with erroneous knowledge described in *P3* and *P4*.

To illustrate these posited relationships, examples of General Motors' (GM) introduction of the Hummer H2 model and Chrysler's introduction of the onboard record player can be used. The Hummer H2 was introduced in the 2003 model year by GM (though it was actually built by AM General). The H2 provided GM with a powerful, militaristic vehicle that was supposed to increase brand strength as competitors did not possess similar designs (high distinctiveness knowledge). Although some customers viewed the H2 in this way, others felt that the low fuel mileage (10-11 miles per gallon[10]), and resulting high pollution it emitted offset any image enhancement it provided (irrelevant knowledge). The vehicle was not connected to any other brands (no complements) at GM so any disadvantages of its introduction, and subsequent withdrawal in the 2009 model year, were relatively limited. Thus, the Hummer H2 provided GM with a minor disadvantage in the form of unique harm.

Chrysler's introduction of the onboard record player in the mid-1950s was supposed to provide customers with individualized music options when other manufacturers did not (high distinctiveness knowledge). It was integrated into vehicles via existing wiring and speakers (complements). Although initial response was positive, a moving vehicle caused needles to skip and made it difficult to flip records over, thereby leading to withdrawal from Chrysler vehicles[11] (irrelevant knowledge). Thus, the onboard record player provided Chrysler with a disadvantage in the form of unique harm:

P9. Firms engaging in radical innovation by acquiring highly distinctive and irrelevant knowledge can face minor competitive disadvantage through unique harm.

P10. Firms with relative complements engaging in incremental innovation that acquire highly distinctive and irrelevant knowledge can face competitive disadvantage through unique harm.

It does not make a lot of sense for firms to acquire and use knowledge that is irrelevant and has low distinctiveness as there is no way to benefit from it. The *Common Harm* cell (bottom middle of Figure 3), illustrates that when a firm acquires irrelevant knowledge, with no complements, that its competitors possess, it can lead to parity by causing minor common harm via radical imitation. The simultaneous possession of the knowledge does not cause additional harm as there are no complements. However, if a firm possesses complements (bottom middle of Figure 4) it can face unique harm stemming from integrated use with the complements that leads to minor competitive disadvantage via incremental imitation. The imitation is incremental because the knowledge is associated with existing complements.

To illustrate these posited relationships the examples of Chrysler's Plymouth Prowler and General Motors' HHR can be used. Chrysler's introduction of the 1997 Plymouth Prowler, which was unlike any other Chrysler vehicles (no complements), provided customers with an open-wheel vehicle by a major original equipment manufacturer (OEM). The vehicle was similar to vehicles built by non-OEMs, such as Chip Foose[12] (low distinctiveness). The design was good-looking, but the vehicle performance was much less than desirable and overall market demand for open-wheel vehicles was insufficient, so it was discontinued within five years (irrelevant knowledge). Thus, the Prowler provided Chrysler with parity in the form of minor common harm.

General Motors' introduction of the HHR in 2006 provided the manufacturer with a direct competitor for Chrysler's PT Cruiser (low distinctiveness knowledge). The HHR's primary draw was its retro design combined with utilitarian packaging[13]. For GM the cost savings from leveraging engines and components from existing small car models (complements) helped decrease costs enough to offset projected moderate sales volumes. However, the performance of the car did not match its retro design and the market became saturated, and sales

subsequently dropped enough to discontinue the vehicle in 2011 (irrelevant knowledge). Thus, the HHR provided GM with a minor disadvantage in the form of unique harm:

P11. Firms engaging in radical imitation by acquiring low distinctive and irrelevant knowledge can achieve competitive parity through minor common harm.

P12. Firms with complements engaging in incremental imitation that acquire low distinctive and irrelevant knowledge can face minor competitive disadvantage through unique harm.

Discussion, implications and conclusion

Knowledge that is critical and distinctive can significantly enhance competitive advantage. While this relationship is central to the KBV, the inclusion of knowledge that is inferior, obsolete, or invalid helps to place a check on the idea that more knowledge is better. Thus, the idea that knowledge can have negative consequences is integrated into the prevailing KBV of the benefits of knowledge being valuable and rare. This enhances understanding of the complexity of firm knowledge and competitiveness. In addition, the explicit inclusion of complements into the propositions offered here provides added support for examining and understanding knowledge acquisition in a more complete manner. Knowledge acquisition does more than just add to firm capabilities. It can damage a firm's ability to compete successfully when knowledge is erroneous and interferes with existing complements and the operation of previously beneficial routines.

A research limitation of these propositions is the challenge of construct operationalization. Although many have been previously examined, sufficient specificity has not always been present. Performance constructs, such as competitive advantage/disadvantage and opportunity capture/harm have been examined empirically in a variety of ways. At the firm level, accounting and financial market measures can be used. However, at the innovation or imitation level it is more difficult to assess. The data is not always collected by firms, nor made publicly available. Manager perceptions of these constructs can provide some data, but can be problematic (e.g. subjective, self-report). One benefit to this approach, however, is that the *relative* nature of perceived opportunity capture/harm and advantage/disadvantage/parity can be captured.

Managerial perceptions can also be used to identify the criticality and distinctiveness of knowledge, the existence of perceived complements, and the incremental or radical nature of the imitation and innovation. The results of these efforts could be compared to industry experts to assess construct validity and reliability. For example, [McGrath et al. \(1995\)](#) measured firm competence via a survey of managers about how well specific objectives are being met. A similar approach could be used to assess complements. They also measured comprehension through questions about how well important cause and effect relations are understood which could be a proxy for firm knowledge. Discerning the type of criticality of the knowledge can also be done using surveys. Although this provides a subjective measurement, it can ascertain the degree to which the knowledge is deemed to be erroneous, irrelevant, or pertinent that is not outcome-determined by an objective measure.

As a critical form of knowledge, routines can also be difficult to assess for a variety of reasons. [Pentland and Feldman \(2008\)](#) discussed two important issues, identification and comparison, to consider when empirically examining routines. *Identification* focuses on the degree to which a routine can be recognized, while *comparison* looks at searching for similarities and differences of different routines or of the same routine at different points in time. These issues are critically important for examining the propositions offered here. One important consideration is the degree of routine similarity. This is important to determine as the effects of innovation and imitation are based on knowledge that is contained in the routine. Some imitation efforts can result in imprecise routine replication ([Knudsen, 2008](#)) that could interfere with the empirical assessment of the effects. Of additional importance in identifying organizational routines for the purposes of empirically examining organizational

knowledge is the status of a routine's development or diminishment. Of particular importance here is the unlearning of routines that currently represent erroneous knowledge. [Fiol and O'Connor \(2017a, 2017b\)](#) developed a process model to shed light on the process of unlearning routines. The three sub-processes they described could be used to ascertain the degree to which the (erroneous) knowledge is still available to an organization.

Operationalizing incremental and radical imitation and innovation is two-pronged. The issue of incremental versus radical can be assessed by asking the managers in those firms the degree to which the imitation or innovation effort is a departure from their current trajectory. The issue of whether it is imitation or innovation can also be addressed via managers stating the degree to which their firm tried to copy competitors.

In addition to operationalization issues, a limitation to the proposed relationships is the implicit assumption that knowledge is equally critical (pertinent, irrelevant, or erroneous) for a firm and its competitors. Although this can be the case in many sets of competitors ([Spender, 1989](#)), it is likely to not always be the case. However, the complexity of the added combinations of knowledge criticality was deemed to be too great to address here. It is hoped that future research can examine those types of conditions.

Firms are not always effectively organized to develop and use knowledge ([Andreu et al., 2008](#)). The effective use of knowledge includes using pertinent knowledge and avoiding erroneous or irrelevant knowledge. This creates opportunities that lead to beneficial parity or competitive advantage while avoiding harm that leads to costly parity or competitive disadvantage. For example, some new approaches to capturing and using knowledge, such as the integrated use of player performance statistics and financial costs made famous in the movie *Moneyball*, can be beneficial to those using them. These approaches have high knowledge distinctiveness as most competitors are not engaging in them and are risky because their criticality has not been demonstrated. Alternatively, organizations should not automatically follow knowledge-seeking trends because potential competitive disadvantages may accrue from knowledge that is erroneous or irrelevant, especially if complements are present. For example, the explicit, formalized use of knowledge imitation by the Soviet Union when it attempted to copy Boeing B-29 planes down to the minute detail even though there were imperfections and differences in available materials that caused problems in the effectiveness of the aircraft ([Gorman, 1998](#)).

There are at least two reasons why firms should identify their own knowledge acquisition efforts and their competitors' efforts to assess knowledge gaps ([Høerem et al., 1996](#)). First, a firm can better determine if it has erroneous knowledge based on the fact that competitors are searching in different directions from the current knowledge base of the focal firm. Second, the firm can also surmise if competitors are searching for very similar knowledge to that possessed by the firm. This could indicate that the knowledge is pertinent and the firm is on the right track with its continued use of the knowledge ([Porter, 1985](#)), but it also means that parity is increasingly likely if competitors' acquisition efforts are successful. Firms that base their strategy on a competitive advantage that may quickly dissipate need to be cognizant of this alteration in competitive dynamics ([Barney, 1991](#)). In addition, as part of the acquisition effort, paying attention to context and remembering it, will help with potential unlearning in the future when appropriate ([Kluge and Gronau, 2018](#); [Lazaric, 2008](#)).

One aspect of knowledge acquisition that firms need to be aware of is how to maintain some degree of causal ambiguity about their knowledge resources and their performance implications ([King and Zeithaml, 2001](#)). This helps maintain knowledge distinctiveness, thereby enhancing competitive advantage. This may be more difficult in mature industries where knowledge resources between competing firms may overlap considerably ([Cowan and Jonard, 2009](#)), but it is important nonetheless.

As a source of knowledge, organizational routines reduce conscious awareness and increase tacit knowledge ([Bloodgood and Morrow, 2003](#)), which may be a natural solution

to increasing ambiguity. Routines that are developed by an organization embed the potentially unique context of the organization into their structure. This uniqueness can hide important steps in a routine from competitors (Cohendet and Llerena, 2008). Even routines that are copied from a competitor are likely to develop somewhat differently over time depending on contextual differences between the firm and the competitor. One way to proactively enhance ambiguity is to mix in some valuable created knowledge to maintain distinctiveness. For example, Nag and Gioia (2012) identified the process of knowledge adaptation to lead to the development of novel solutions, thus increasing knowledge distinctiveness. Created knowledge can amend low distinctiveness knowledge, typically through experience. For example, in the paper mill industry, the primary machinery is often decades old. Competitors typically know the exact machinery purchased by competitors. However, over time the machine operators build up context-specific knowledge about process optimization (Graham, 2017) which enhances its distinctiveness.

If knowledge integration or other forms of knowledge enhancement are successful, a firm should protect its knowledge from competitors (Bloodgood and Salisbury, 2001). This concern is a principal component of the KBV. The potential for competitive advantage can be lost once competitors acquire the knowledge, which can occur quickly (Mansfield, 1985). Competitors may have the opportunity to substitute other knowledge or resources, rather than imitate, to accomplish the same goal (Barney, 1991). Competitors who substitute for a particular type of knowledge can pose a large threat to a firm if the substituted resource is more pertinent than the original knowledge. Thus, firms possessing high distinctiveness knowledge may try to demotivate competitors from attempting substitution through enhanced investment in informal routines (Cohendet and Llerena, 2008) and methods such as continuous improvement, switching costs, and decreasing market attraction (McEvily *et al.*, 2000).

Finally, the question remains as to how a firm initially becomes good at knowledge management. Acquiring and using the right knowledge requires some combination of experience and ability (and possibly luck). Experience is gained over time through engagement in knowledge management activities and assessment of their outcomes; a process also available to competitors. Firms may benefit from making a more conscious effort to direct this process. In the branding literature, Aufreiter *et al.* (2003) suggests a more explicit and analytical approach to determining what is important and valuable in regards to product features. The same could be said here as firms that are more proactive in their efforts to identify the usefulness and distinctiveness of knowledge may be able to gain unique insights. For instance organizational members and key industry experts could be surveyed to provide data from a variety of people for analysis.

The above discussion identifies a range of strategic issues that managers should examine when determining their strategy for knowledge acquisition. A variety of ways to operationalize the pertinent constructs were also identified, which could be used in future research. A compelling line of inquiry for researchers is to determine how existing and future knowledge resources should be integrated within a firm. In addition, this process may need to adjust over time within a firm (Eslami *et al.*, 2018). The possession and use of firm resources, as claimed by the RBV, has a significant effect on firm performance. However, little has been said about the infusion of new knowledge resources and the potential harm they may cause. Following the avenue of research suggested here may enable researchers to better determine the degree to which new knowledge resources are actually beneficial. The same knowledge may be found to be beneficial to a firm and detrimental to its competitor. Findings from this type of research could enhance the complexity and expand the usefulness of the RBV. Moreover, as the acquisition of new knowledge resources potentially includes exposure to new routines, there are likely implications for the routines literature in regards to the unforeseen benefits and drawbacks from formal and informal modifying of organizational routines as some of these may have significant path dependencies associated with them (Theeke *et al.*, 2017).

Expanding on this same logic, researchers interested in studying strategic alliances may want to consider all of a target firm's knowledge resources when determining performance implications rather than primarily only focusing on specific strategic knowledge (e.g. technologies) that acquirers are most interested in accessing. Firms gear their alliance partner selection, in part, based on the types of knowledge they expect to access from the partner (Yayavaram *et al.*, 2018). Tacit, unobserved or disregarded knowledge may provide benefits or harm that may have been initially overlooked (Akhavan *et al.*, 2018). This type of research will be challenging given that initial determinations of knowledge criticality may be imperfect.

Moreover, research attention placed on a more comprehensive set of knowledge resources may result in discovering more precise knowledge acquisition effects of firm heterogeneity that is associated with path dependency. Firms that focus on knowledge acquisition and exploitation create a context whereby innovation is enhanced (Crescenzi and Gagliardi, 2018). The path dependent nature of a firm's context provides opportunity for absorptive capacity related differences among competitors. In addition, the extent to which firm context contains different types and degrees of organizational slack and absorptive capacity can influence the knowledge acquisition process concerning innovation (Wang *et al.*, 2017). Examination of these differences, how they are created, and their effects on knowledge acquisition, imitation, and innovation can expand our understanding of firm rivalry and related topics.

This examination used key elements of the innovation, KBV and routines literatures to identify the competitive advantage effects of knowledge acquisition and to identify the opportunities and harm that firms may face with new knowledge. In addition, it was designed to explicate the differences in outcomes that occur depending on knowledge source and the presence of firm complements. It was deduced that the presence of complements can further enhance opportunity capture and increase harm if erroneous or irrelevant knowledge is integrated into the knowledge bases of the firm. Based on these outcomes, firms face significant challenges to ensure their knowledge management efforts are beneficial.

Notes

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