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Bricolage effects on new-product development speed and creativity: The moderating role of technological turbulence☆

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ABSTRACT

This study provides a theoretical account of bricolage effects on two critical new-product advantages. Survey data from 222 firms reveal that bricolage hastens new-product development (NPD), but has an inverted U-shaped relationship with new-product creativity. However, under high technological turbulence, bricolage has an enhanced positive association with NPD speed. Consequently, this study contributes to bricolage theory and practice by revealing how bricolage influences new-product advantages and identifying boundary conditions for successful NPD.

1. Introduction

Developing new products successfully is vital for firms to generate and maintain competitive advantage in a competitive marketplace (Sheng, Zhou, & Lessassy, 2013; Zhou & Li, 2012), especially for firms in emerging economies such as China, striving to be globally influential innovators (Liu, Ding, Guo, & Luo, 2014). However, many firms from emerging economies face turbulent technological and market competition, often lack sufficient resources (Gao, Xie, & Zhou, 2015; Yi, Li, Hitt, Liu, & Wei, 2016), and have less-developed external capital market accessibility (Hoskisson, Eden, Lau, & Wright, 2000).

One strand of the literature posits that a firm's resource construction activities can provide viable solutions under resource constraints (Baker, Pollock, & Sapienza, 2013; Salunke, Weerawardena, & McColl-Kennedy, 2013; Steffens, Senyard, & Baker, 2009). Among them, *bricolage*, defined as "making do with whatever is at hand by reuse and recombination" (Baker & Nelson, 2005, p. 333) has been identified as an approach to new-product development (NPD) (e.g., Cunha, Rego, Oliveira, Rosado, & Habib, 2014; Senyard, Baker, Steffens, & Davidsson, 2014). However, the exact relationship between bricolage and new-product outcomes remains the topic of an ongoing debate (Bechky & Okhuysen, 2011; Ciborra, 1996; Lanzara, 1999).

On one hand, bricoleurs remedy resource constraints, help firms enhance innovation by improvising (Baker, Miner, & Eesley, 2003), and gather new materials and knowledge for meeting time demands (Garud & Karnøe, 2003). For instance, through bricolage, small and medium enterprises (SMEs) can improvise ways to cope with difficulties and hasten new information system development (Ferneley & Bell, 2006). On the other hand, since bricolage is usually embedded in local, uniplex networks and focuses on immediate local needs (Baker, 2007), it has gradually leveling positive effects on innovation; the positive effects may turn negative for a lack of heterogeneous resource and knowledge (Senyard et al., 2014).

We argue that one notable reason for these mixed results is that existing studies have failed to explicitly identify the role of bricolage on two new-product advantage (NPA) dimensions: *NPD speed* and *new-product creativity* (NPC) (Chen, Damanpour, & Reilly, 2010; Im & Workman, 2004), two strategic determinants of new product success (Cui, Wen, Xu, & Qin, 2013; Sheng et al., 2013). In fact, bricolage brings different process knowledge, product knowledge, and critical resources that may influence these two NPA dimensions differently. However, previous studies have not considered this issue.

Therefore, the present study contributes to existing literature by focusing on two shortcomings. First, it hypothesizes and empirically validates how and why bricolage influences two dimensions of NPA differently: NPD speed and NPC. Specifically, this study integrates the theoretical argument that superior skills or superior resources affect positional advantages (Day & Wensley, 1988) and bricolage literature (Baker, 2007; Baker & Nelson, 2005; Senyard et al., 2014) to argue

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that bricolage contributes positively to NPD speed, but has an inverted U-shaped relationship with NPC.

Additionally, this study provides both the direct linkage and the moderating route by which bricolage differentially affects these NPA dimensions. Specifically, drawing on the contingency view, it explores how bricolage value is contingent on the level of *technological turbulence*, which influences firm's resource decisions and behaviors (Ciborra, 1996; Fisher, 2012) and creates unique opportunities and challenges for NPD (Sheng, Zhou, & Li, 2011; Zhao, Cavusgil, & Cavusgil, 2014). Technological turbulence reflects the rate of innovation in the industry and pushes firms to adjust their NPD pace to cope with external competition, thus representing a critical force that can alter the value of bricolage activities. In that, the present study shows that both the firm's bricolage activity and external technological conditions may interactively influence NPA. Consequently, it highlights the relevance of creating new value from existing resources that prior business managers and the academic communities have generally missed. This study also informs that managers should properly recombine resources at hand to gain NPA rather than wait for external and expensive resources, especially when technology changes rapidly. However, these decision makers should also be aware that appropriate responses to resource constraints depend on the understanding that diverse NPA goals require different bricolage strategies.

2. Theoretical background and hypotheses development

2.1. Bricolage as a neglected source of NPA

This study uses the "source-position" framework (Day & Wensley, 1988) and perceives bricolage as a *source* of NPA. This framework shows that "a firm's superior skills/resources yield positional advantages" (Day & Wensley, 1988, p. 3). Superior skills allow firms to perform more effectively or adapt more responsively to market changes than competitors. Superior resources can also give long-term positional advantages in providing superior value for customers.

This framework has been used to examine the antecedents of NPD positional advantages. For example, Kim and Atuahene-Gima (2010) suggest that exploratory and exploitative market learning as two types of superior capability are sources of advantage, which can leverage new knowledge and best use existing knowledge to bring two types of positional advantages, namely, new-product differentiation and new-product cost efficiency. Ahmadi, O'Cass, and Miles (2014) find that the interaction between marketing resources and capability, or the interaction between technology resources and capability are different sources of advantages which can complement with each other to acquire positional advantages, namely: first-product differentiation and first-product cost efficiency. Although this line of research is valuable in revealing the potential impact of resources or capacity on positional advantages, it offers limited insights into specific ways to build positional advantages when firms' internal resources are constrained.

Meanwhile, emerging bricolage literature suggests that bricolage can provide advantages when resources are constrained (Baker et al., 2013; Salunke et al., 2013; Steffens et al., 2009). For example, new ventures under resource constraints can use and recombine resources at hand to gain advantageous strategic positions (Steffens et al., 2009). As such, service firms can use bricolage to find heterogeneous value in ostensibly identical resources to enhance service innovation and acquire favorable competitive positions (Salunke et al., 2013). Similarly, resource-constrained organizations may skillfully use bricolage strategies to resist and change cognitive institutions to gain competitive advantages (Baker et al., 2013). Extending this logic, bricolage could be a source of NPA.

Innovation and strategy literature explains that firms gain NPA when they continuously strive to assure that their products are competitively superior (Day & Nedungadi, 1994; Day & Wensley, 1988). NPA can take many forms, including new-product quality, reliability, creativity, cost efficiency, and uniqueness (e.g., Ahmadi et al., 2014; Im & Workman, 2004; Kim & Atuahene-Gima, 2010). Base on the framework of "source–position", this study focuses on both competitor and customer viewpoints and emphasizes that NPD speed and NPC are key dimensions of positional NPA, in agreement with previous studies (e.g., Chen et al., 2010; Im & Workman, 2004; Zhao et al., 2014). Although NPD speed and NPC may correlate (Ganesan, Malter, & Rindfleisch, 2005; Parker, Krause, & Covin, 2015), they often have different antecedents and consequences (Ganesan et al., 2005; Sheng et al., 2013), and many studies take them as independent variables (e.g., Cui et al., 2013; Zhao et al., 2014). Therefore, this study explores why and how one type of antecedents may have differential effects on NPD speed and NPC (Cui et al., 2013; Fang, 2008).

NPD speed refers to "the speed with which new products are developed" (Ganesan et al., 2005, p. 57). Time-based competition, first-mover advantage, and fast-followers literature (e.g., Kessler & Chakrabarti, 1996, p. 1143; Menon, Chowdhury, & Lukas, 2002, p. 324) all indicate that NPD speed may be beneficial for competitive advantage. Under rapidly changing business environments, competitive advantages often depend on whether firms can provide the required value in the least amount of time and ahead of their main competitors (Cankurtaran, Langerak, & Griffin, 2013).

NPC, another key reflection of NPA (Im & Workman, 2004), refers to the ability to introduce novel products or think of original features (Ganesan et al., 2005). New-product innovativeness is critical because customers are compelled to buy innovative products that may be a better fit for their needs (Langerak, Hultink, & Robben, 2004). Although NPD speed and NPC require different types of knowledge and resources, they are both important in assuring that new products will be successful (Cankurtaran et al., 2013; Sheng et al., 2013). Therefore, firms must consider how and when they can best improve NPA under resource-constrained environments. As such, firms can use bricolage to gain positional advantages under resource constraints (Baker et al., 2013; Salunke et al., 2013; Steffens et al., 2009). Their bias for action and improvisation can help hasten NPD, while heterogeneity of knowledge and methods of creative recombination may affect NPC (Garud & Karnøe, 2003; Senyard et al., 2014). Subsequently, this inspects the specific effects of bricolage on NPA's two dimensions.

2.2. The specific effect of bricolage on NPA

The source-position framework suggests that a firm's superior skills yield positional advantages, allowing the firm to perform more effectively or adapt more responsively to market changes than competitors (Day & Wensley, 1988). As such, bricolage is an important source of advantages, which can help a firm build appropriate skills to quickly reconstruct resource combinations under resources constrained contexts (Baker et al., 2013; Salunke et al., 2013; Steffens et al., 2009). NPD speed is one type of positional advantage, which focuses on time based competition with competitors (Kessler & Chakrabarti, 1996; Menon et al., 2002), and this study shows how bricolage can positively affect NPD speed for the following reasons.

First, NPD speed often depends on the timely accumulation of process knowledge (Ganesan et al., 2005) for prototypes and manufacturing designs (Millson, Raj, & Wilemon, 1992). Through trial-and-error, bricolage can bring intimate manufacture and process knowledge from handy resources in a timely manner that hastens NPD (Baker & Nelson, 2005). For example, a study of Moroccan farmers shows they use bricolage to successfully adapt their knowledge of drip irrigation in a short time (Benouniche, Zwarteveen, & Kuper, 2014).

Second, bricolage entails a refusal to enact limitations and help the firm test critical materials and technologies for rapid NPD (Garud & Karnøe, 2003). Bricoleurs use amateur skills to provide timely technology supplies (Baker & Nelson, 2005) and recombine internal and external workable methods to hasten NPD (Banerjee & Campbell, 2009). For example, during the development process of Danish wind turbines,

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