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Enhancing Innovation Performance through Business Process Innovation: The Strategic Role of External Collaboration

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ABSTRACT

Purpose: This research examines the effects of collaboration with external firms on innovation performance, with a specific focus on the mediating influence of business process innovation. The objective is to explore how external collaborations contribute to improving innovation performance by facilitating internal process innovations, enabling firms to effectively convert external knowledge into practical innovation results.

Design/methodology/approach: Utilizing data from the Korean Innovation Survey (KIS), this research utilizes logistic regression analysis to test the hypotheses concerning the relationships between external collaboration, business process innovation, and innovation performance. It measures innovation performance associated with product innovation and assesses collaboration with external firms via a survey.

Findings: The results demonstrate that external collaborations enhance innovation performance, emphasizing the value of external knowledge and the pivotal role of business process innovation in transforming this knowledge into tangible outcomes. This highlights the critical need to refine internal processes to maximize the benefits of external partnerships.

Research limitations/implications: This study is limited by its focus on small and medium-sized enterprises in South Korea's manufacturing sector, so it may not fully represent the dynamics in other countries or sectors. Future research should explore the influence of external knowledge on firm performance across diverse contexts.

Originality/value: This research contributes to the existing literature by highlighting the pivotal role of business process innovation as a key mediator in integrating external collaboration into firms' innovation strategies. By providing empirical insights into the innovation practices of South Korean firms, it enriches the global discourse on innovation management. This study's integration of open innovation, firm attributes, and business process innovation into a unified analysis offers a comprehensive perspective on the factors influencing innovation success and underscores the importance of internal processes in maximizing the benefits of collaboration with external firms.

Keywords: Collaboration with external firms, Innovation performance, Process innovation, Mediation effect

I. Introduction

Innovation activities play a central role in shaping

the performance of firms and, more broadly, impacting the overall economy. As Schumpeter (1942) argued, groundbreaking innovation initiatives, such as the development of new products, are recognized as a vital force for continuous economic growth. Radical innovations have the power to replace existing products, create new markets, and reshape market

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dynamics. They also disseminate new technological knowledge to firms in both similar and diverse industries.

Much research and theory have been conducted to understand firm innovation performance. Previous studies primarily focused on firm attributes such as size and experience (Acs & Audretsch, 1990; Baik & Kang, 2020; Cohen & Klepper, 1996; Schneider & Veugelers, 2010), market structure (Arrow, 1962; Greenstein & Ramey, 1998), CEO characteristics (Moon, 2017), and relative positioning of firms (Lerner, 1997). However, recent focus has been on the effects of firm collaboration on radical innovation and the resultant knowledge spillover effects (Chowdhury et al., 2023; Hájek & Stejskal, 2018). Radical innovation involves surpassing existing products in terms of innovation and requires external technological knowledge and research. Therefore, the ability to acquire and effectively utilize external technological knowledge together with internal R&D (research and development) capabilities, is considered a critical factor in innovation success. One way to achieve this is through partnerships with external firms or institutions (d'Aspremont & Jacquemin, 1988; Cassiman & Veugelers, 2002). Collaboration can foster innovation by allowing access to empirical knowledge, predominantly explicit and tacit knowledge.

This study examines the multifaceted impact of collaboration with external firms on innovation performance. A critical aspect of this collaboration is the exchange and integration of knowledge, which has been identified as a critical mechanism for enhancing organizational creativity and innovation (Van Wijk et al., 2008). However, the benefits of external collaborations come with challenges. The complexity of managing cross-organizational relationships, cultural integration, and safeguarding intellectual property rights presents significant hurdles that firms must navigate to realize the potential advantages of such partnerships (Van Wijk et al., 2008; Dyer et al., 2004).

This study investigates business process innovation's role as a critical driver of innovation performance. Business processes, defined as the aggregation of

tasks and activities aimed at achieving organizational objectives, are the foundation on which firms build their operational and strategic initiatives (Hammer & Champy, 2006). Innovating these processes through the adoption of new technologies or the optimization of existing workflows directly contributes to enhancing operational efficiency, customer satisfaction, and ultimately, innovation performance (Davenport, 1993). This study analyzes the mediating effect of business process innovation in the relationship between collaboration with external firms and innovation performance. This conceptualization suggests that the benefits of external collaboration on innovation performance are magnified when coupled with strategic business process innovations that integrate external knowledge and resources effectively within the firm's operational fabric.

This paper enhances the literature in three primary ways. Firstly, it emphasizes the critical role of business process innovation as a key mediator in integrating external collaborations into firms' innovation strategies. While previous research has explored mechanisms such as trust and satisfaction (Hwang et al., 2022) and R&D efforts (Zhu et al., 2019) to elucidate the relationship between external collaboration and innovation performance, a substantial gap remains in understanding the "black box" that connects these elements. This study aims to fill this gap by examining how business process innovation acts as a conduit for leveraging external collaborations for innovation performance enhancement.

Secondly, by utilizing data from the Korean Innovation Survey (KIS), this study provides valuable empirical insights into the innovative practices of South Korean firms, contributing to the broader discourse on global innovation processes. This localized perspective offers a unique perspective on the universal challenges and strategies in innovation management, thereby enriching the comparative analysis of innovation practices across different geographical contexts.

Lastly, the paper integrates diverse theoretical perspectives, merging concepts from open innovation, firm attributes, and business process innovation. This

synthesis facilitates a comprehensive analysis of innovation management, distinguishing the paper through its focus on the mediating role of business process innovation in the dynamic between external collaboration and innovation performance. Such an approach not only broadens the understanding of the factors influencing innovation success but also highlights the importance of internal processes in maximizing the benefits of external collaborations for innovation outcomes.

II. Literature Review and Hypothesis Development

Collaboration with various partners, including external firms, research institutions, and government agencies, plays a crucial role in pursuing innovation in a complex and interconnected business environment. Many studies have emphasized the significant impact of such collaboration on innovation and creativity. Particularly, open innovation highlights the pivotal role of external partners in sharing knowledge and accessing new ideas and technologies (Chesbrough, 2003; West & Bogers, 2014). Firms can leverage a wide range of expertise and innovation-related specializations by sharing knowledge and technologies with various partners (Van Wijk et al., 2008). Such knowledge and technologies can also enhance decision-making and improve problem-solving abilities. Additionally, collaboration with external firms can involve financial investments and shared costs of joint research and development. It can also provide access to additional resources and funding opportunities such as government agency research grants (Teece, 1986).

While collaboration with various external partners has many advantages, it also has challenges. Collaborating externally means facing complex challenges related to managing diverse teams, harmonizing different organizational cultures, and protecting intellectual property rights (Van Wijk et al., 2008).

Additionally, collaboration often requires coordinating between organizations with diverse practices, values, and goals (Dyer et al., 2004). Therefore, to leverage the positive effects of collaboration with external firms, various issues must be well-coordinated.

A. The Impact of Collaboration with External Firms on Innovation Performance

Among collaborations with various partners, collaboration with external firms is increasingly recognized as a crucial driver for innovation, enhancing competitiveness and improving innovation performance across industries. The strategic input from collaboration with external firms extends beyond mere financial or informational gains, encompassing technological advancements, market insights, and broader network access. These partnerships facilitate access to specialized expertise and cutting-edge technology previously beyond firms' reach, expediting the development of innovative offerings (Chesbrough, 2003). The combination of diverse resources and knowledge bases that these collaborations provide is essential for the successful execution of R&D initiatives (Van Wijk et al., 2008), and enables the creation of new solutions that go beyond existing mindsets and enable the improvement of existing products or services, thereby contributing to organizations' competitive market advantages.

Moreover, the dynamic nature of global markets demands that firms adopt resilient innovation strategies. Collaboration with external firms enables firms to quickly adapt to market shifts, technological changes, and various regulations, aligning their innovation efforts with current trends and customer expectations (Belderbos et al., 2004; Hitt et al., 2000). Hagedoorn (2002) illuminated the beneficial impacts of collaboration with external firms, demonstrating their positive effects on financial performance, innovation outcomes, and overall competitiveness.

In summation, collaboration with external firms is pivotal to strengthening firms' innovative capabilities and securing competitive edges. Such synergistic

partnerships facilitate deeper engagement with the complex landscape of innovation, yielding significant improvements in innovation performance, financial success, and market positioning.

Hypothesis 1: Collaboration with external firms has a positive effect on innovation performance.

B. The Impact of Business Process Innovation on Innovation Performance

Business processes are defined as a series of related tasks and activities performed within an organization to achieve specific objectives (Hammer & Champy, 2006). Business processes are an organization's core activities and managing them efficiently plays a crucial role in organizational success. First, well-designed processes eliminate unnecessary duplication of effort and use resources efficiently, thereby enhancing overall work efficiency (Davenport, 1993). Second, the standardization and optimization of processes ensure consistent outcome quality, thereby increasing customer satisfaction and enhancing brand reliability (Juran, 1988).

Various factors enable business process innovation. First, the introduction of new technology serves as a driving force to improve current or develop new processes (Brynjolfsson & Hitt, 2000). Second, market and competition changes pressure organizations to operate more efficiently and effectively. These influences lead firms to engage in process innovation activities to secure competitive advantages (Porter, 1985).

Implementing impactful process innovations can directly boost innovation performance outcomes. There are three reasons why this is the case. First, the implementation of business process innovation improves operational efficiency. Process innovations, such as streamlining processes through automation, integration, and simplification, lead to greater outputs with fewer inputs resulting in superior financial returns and the freeing up of resources that can be redirected toward growth initiatives (Heckl et al., 2010). Second, product development cycles can be

improved through business process innovation. Innovations in core design and development processes, such as implementing agile methodologies, often translate to faster and more flexible product innovation cycles (Buganza et al., 2009). This allows firms to respond better to customer needs. Third, business process innovation enhances customer centricity. Business process innovations that transform the quality and convenience of customer interactions, such as omnichannel retail models, result in higher customer satisfaction, retention, and lifetime value (Belvedere et al., 2013). Overall, properly implemented business process innovation initiatives can directly amplify different aspects of organizational innovation performance from operational enhancements to improved customer experiences and innovative services.

Hypothesis 2: Business process innovation has a positive impact on innovation performance

C. The Mediating Role of Business Process Innovation on the Relationship between Collaboration with External Firms and Innovation Performance

Various studies have examined the positive impacts of collaboration with external firms on innovation performance (Hammer & Champy, 2006). Additionally, research has attempted to identify the mediating factors that explain how collaboration with external partners contributes to firms' innovation performance. For example, Gassmann et al. (2010) presented the transfer and acquisition of tacit knowledge as important mediating variables. Through interviews with 111 firms, they found that while collaboration provided access to new expertise, excellent innovation performance depended on the internalization and integration of that knowledge. Laursen and Salter (2014) empirically demonstrated the mediating effect of organizational learning. Using survey data from British firms, they showed that the learning and internalization of external knowledge mediate the correlation between the openness of collaboration

and innovation productivity. Bstieler et al. (2017) found that the time and investment devoted to building trust and commitment mediate the impact of collaboration on innovation performance. Tortoriello (2015), considered network factors, adopted a social network perspective, and revealed that the centrality of a firm's network in the technological domain mediates the impact of collaboration. This research, using patent data, confirmed the hypothesis by showing that access to various knowledge sources acts as a mechanism to increase innovation productivity along with more external relationships.

Prior research has primarily concentrated on the advantageous conditions under which a firm can acquire substantial knowledge and information from external partners, as well as the methods for internalizing this acquired knowledge and information. Yet, there has been minimal exploration of the effective utilization of this acquired knowledge and information. Consequently, this paper explores business process innovation as a means to transform acquired knowledge into more tangible outcomes.

Various studies have explored the impact of collaboration with external firms on innovation performance, highlighting the importance of both the mechanisms of collaboration and the conditions under which firms effectively internalize and utilize acquired knowledge. Hammer and Champy (1993) initially examined the positive impacts of such collaborations. Gassmann et al. (2010) identified the transfer and acquisition of tacit knowledge as critical mediators, finding through interviews with 111 firms that excellent innovation performance hinges on the internalization and integration of external expertise. Similarly, Laursen and Salter (2014) demonstrated that organizational learning mediates the relationship between the openness of collaboration and innovation productivity, based on survey data from British firms.

Further studies have deepened the understanding of these dynamics. Bstieler et al. (2017) noted that the time and investment in building trust and commitment are pivotal in mediating the impact of collaboration on innovation performance. Tortoriello (2015) took a social network perspective, showing

that a firm's network centrality in the technological domain serves as a mediator, enhancing innovation productivity through broader access to diverse knowledge sources.

Incorporating recent findings, knowledge sharing, strategic innovation implementation, and product innovation have emerged as key mediators that transform external collaborations into enhanced innovation outcomes. In a study of 112 cross-industry firms, knowledge sharing and innovation strategy were identified as complete mediators, showing the vital role of strategically utilizing external knowledge (Bagherzadeh et al., 2019). Another analysis with high-tech firms in Taiwan found that knowledge integration capabilities not only directly influence innovation performance but also act as partial mediators in the relationship influenced by network centrality and knowledge heterogeneity, underscoring the impact of network structure and diversity (Wang et al., 2018). Additionally, research involving 1516 Spanish firms revealed that product innovation, facilitated directly or through knowledge sharing, serves as a key mediator in translating external stakeholder co-creation into better innovation outcomes (Markovic & Bagherzadeh, 2018). These findings emphasize the diverse and significant roles of mediators like knowledge sharing, strategic innovation implementation, and product innovation in harnessing the benefits of external collaborations for innovation performance.

As we consider the implications of these mediating factors, it becomes crucial to examine how these collaborative innovations are integrated and managed within the firms. Business process innovation emerges as a critical link in this chain, transforming external knowledge and collaborations into real-world operational successes. This integration process not only supports but is central to the strategic application of innovative concepts and technologies, ensuring that they are not only adopted but also effectively implemented to achieve competitive advantage and operational efficiency.

The profound significance of business process innovation lies in its ability to adapt externally sourced

knowledge into the organization's daily operations, thus enabling consistent and productive management of innovation projects. Innovative concepts and state-of-the-art technologies are crucial for advancement. However, their true value is realized when they are smoothly integrated into an organization's current operational processes and strategic frameworks. At its core, business process innovation serves as the link between the potential of external innovation and the realization of these ideas within an organization's internal mechanisms. It ensures that new insights are not only received but are also effectively implemented, transforming them from theoretical concepts into impactful and practical innovations. This essential role of business process innovation highlights its importance as both a mechanism for adaptation and a strategic instrument for leveraging external knowledge, thus significantly boosting organizational capacity for product innovation and, consequently, its competitive standing in the market (Hagedoorn, 2002). Viewed through this perspective, business process innovation is recognized not just as a pathway to operational enhancements but as a pivotal strategic resource. This is indispensable for fostering and implementing product innovation within a constantly evolving business landscape. Figure 1 summarizes all the hypotheses.

Hypothesis 3: Business process innovation mediates the relationship between collaboration with external firms and innovation performance.

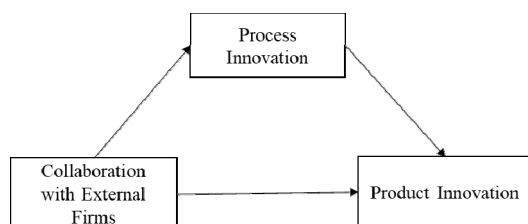


Figure 1. Predicted relationships

III. Methods

A. Data

This study utilized data from the Korean Innovation Survey (KIS) conducted by the Science and Technology Policy Institute (STEPI). The survey was designed according to the internationally recognized Oslo Manual (2023) and has been conducted since 2002, targeting domestic manufacturing and service firms. This study used data from the latest survey conducted in 2020 which targeted a sample of 4,000 firms stratified by firm size and industry from a total of 50,785 firms (Hwang et al., 2022). The survey provided data suitable for innovation-related research, including the extent of external knowledge and innovation and differentiation strategies. Excluding firms without relevant data, the final sample used for analysis included 2,353 firms.

B. Variable Measurement

The detailed measurement items of variables and measurement methods are provided in Table 1.

1. Dependent variable

This study adopted product innovation as an indicator of innovation performance. Innovation is defined by the Oslo Manual (2023) as new or significantly improved products or services. This study measured this variable by whether a firm had launched new products or services in the market. Specifically, the innovation performance of firms that launched new or significantly improved products or services in the past three years (from 2017 to 2019) was marked as 1, and those that did not were marked as 0.

There are numerous methods to measure innovation performance, including patent counts, the introduction of new products, and the proportion of sales derived from these products (Cordero, 1990). While this metric of launching a new product has limitations,

it provides an appropriate approximation to gauge innovation performance and commonly employed in innovation research (Ardito et al., 2021; Erumban and Timmer, 2012; Giannopoulou et al., 2019)

2. Independent variable

Collaboration with external firms during the previous three years was assessed by surveying

participants on their utilization of information and knowledge acquired from these firms, using a 1-to-5 Likert-type scale.

3. Mediating variable

Business process innovation was measured in six areas: product manufacturing, distribution and logistics, marketing and sales, information and communication

Table 1. Measurement items of variables and measurement methods

Variables	Measurement Item	Type
Dependent variable: Innovation Performance	Did your company launch a new product, which is new or significantly improved from your existing products in the last 3 years (2017-2019)?	Dummy (takes 1 if yes and 0 otherwise)
Independent variable: Collaboration with External Firms	Please rate the degree of collaboration with external firms as a source of ideas and information for innovation.	0 if no collaboration, 5-point Likert scale if there was collaboration (1-very low, 5-very high)
Mediating variable: Business Process Innovation	Did your company implement either a new or significantly improved business process in the following 6 areas of business functions, over the last 3 years (2017-2019)?	Average value of the 6 dummy variables defined below.
1) Production of goods or Services	Engineering and related technical testing, analysis, certification, production support	Dummy (takes 1 if yes and 0 otherwise)
2) Distribution and logistics	Transportation and service delivery, warehousing, order processing	Dummy (takes 1 if yes and 0 otherwise)
3) Marketing and sales	Advertising, promotion, packaging, marketing, exhibition, market research, pricing strategy, customer service and support, sales and after-sales activities	Dummy (takes 1 if yes and 0 otherwise)
4) Information systems	Hardware and software, data processing and database, maintenance and repair, web-hosting and other computer related information activities	Dummy (takes 1 if yes and 0 otherwise)
5) Administration and management	Organizing work responsibilities, decision making, corporate governance, accounting, bookkeeping auditing, payments, finance and insurance activities, human resource management, procurement, management of external relationships with suppliers	Dummy (takes 1 if yes and 0 otherwise)
6) Product and business process development	Internal or external activities to scope, identify, develop, adapt products	Dummy (takes 1 if yes and 0 otherwise)
Control Variables	Based on previous literature, 5 quantitative measures are included as control variables	
Firm Age	Number of years from the company establishment date	Continuous
Firm Size	Number of full-time employees (log-transformed)	Continuous
Firm Sales	Company sales (in millions of won) in the last year (log-transformed)	Continuous
Firm R&D expenditure	R&D expenditure (in millions of won) in the last year (log-transformed)	Continuous
Industry Classification	The 24 industry divisions (i.e., first two digits) of the KSIC (Korean Standard Industry Classification) code.	24 dummy variables

systems, administration and management, and product and business process development following the methodology suggested by the Osol Manual in 2018. If there was innovation in a given area, it was marked as 1; otherwise, it was marked as 0. These dummy variables were summed and then divided by 6 for standardization. The maximum value was 1, and the minimum value was 0.

We aim to evaluate the overall extent of business process innovation by measuring the average score across six domains rather than concentrating on a specific domain. This method allows us to examine whether any particular area of business process innovation uniquely influences innovation performance (Kunttu et al., 2021). By doing so, we ensure a holistic assessment of how business process innovation affects overall innovation outcomes.

4. Control variables

Various factors that could influence innovation performance were included as control variables to analyze the impact of collaboration with external firms on innovation performance. Based on prior research, firm age and size were included as control variables (Park et al., 2020). Firm size was measured by the number of employees and then log-transformed. Additionally, considering that firms' R&D expenditures and sales significantly affect innovation performance, these were also included as control variables (Lee Jong-sun et al., 2016). The Korean Standard Industry Classification (KSIC) was used to categorize industries

and to reflect performance differences across industries. The 24 industry divisions (i.e., first two digits) of the KSIC code were used for this purpose.

IV. Results

Statistical summaries of the variables used to test the hypotheses are provided in Table 2. This table shows the mean values, standard deviations, and correlations of the variables, revealing the overall characteristics of the data used for analysis. Since the dependent variable was set as a dummy variable, logistic regression analysis was used to verify the hypotheses. The variance inflation factor (VIF) identified in the analysis process was below 10, indicating no multicollinearity and enhancing the reliability of the analysis results.

The effect of collaboration with external firms on innovation performance was analyzed using logistic regression analysis. Table 3 shows the results of logistic regression analyses. To assess the mediating effects, the three-step method proposed by Baron and Kenny (1986) was utilized. The first step necessitates demonstrating a significant correlation between the independent and dependent variables. In Model 2, this was evidenced by an increase in innovation performance correlating with enhanced collaboration with external firms ($p < 0.001$), affirming Hypothesis 1. The second step required showing that

Table 2. Mean, standard deviation, and correlation coefficient

	Variable	Mean	SD	1	2	3	4	5	6	7
1	Innovation Performance	0.31	0.46	1						
2	Sales	10.66	1.81	0.12*	1					
3	Firm Size	4.72	1.37	0.14*	0.9*	1				
4	Firm Age	23.16	13.89	0.07*	0.43*	0.44*	1			
5	R&D	0.62	0.10	0.22*	-0.05*	0.08*	0.03	1		
6	Collaboration with External Firms	1.02	1.71	0.21*	0.22*	0.25*	0.13*	0.13*	1	
7	Business Process Innovation	0.18	0.39	0.21*	0.2*	0.23*	0.13*	0.13*	0.34*	1

* $p < 0.05$

the mediator significantly and positively influenced the dependent variable. Here, an escalation in business process innovation was observed to positively affect innovation performance ($p < 0.001$), thereby supporting Hypothesis 2. The final step entailed adjusting for the impact of the independent variable on the dependent variable while verifying the effect of the mediator on the dependent variable. Model 4 revealed that, even after accounting for the impact of collaboration with external firms on innovation performance, the influence of business process innovation remained significant ($p < 0.001$), thus endorsing Hypothesis 3.

Additionally, a Sobel test was used to examine the mediation effect (Sobel, 1986). The product of coefficients was used because of its lower Type I

error rate and higher statistical power (Preacher and Hayes, 2004). Table 4 displays the significant mediating effect of business process innovation on the relationship between collaboration with external firms with innovation performance ($Z = 2.95$, $p < 0.001$), confirming Hypothesis 3. The effect ratio of each suggests a full mediation effect (Jose, 2008).

V. Conclusion and Implications

This study contributes significantly to the understanding of how collaboration with external firms and business process innovation influence

Table 3. Results of logistic regression analyses

Dependent Variable: Innovation performance	Model 1	Model 2	Model 3	Model 4
Sales	0.111 (0.08)	0.102 (0.08)	0.109 (0.08)	0.103 (0.08)
Firm Size	0.017 (0.08)	-0.025 (0.08)	-0.014 (0.08)	-0.041 (0.08)
Firm Age	0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.001 (0.00)
R&D	5.514*** (0.54)	5.143*** (0.54)	5.188*** (0.54)	4.966*** (0.54)
Collaboration with External Firms		0.204*** (0.03)		0.163*** (0.03)
Business Process Innovation			0.864*** (0.12)	0.682*** (0.12)
Constants	-5.641*** (0.69)	-5.352*** (0.70)	-5.430*** (0.70)	-5.248*** (0.71)
Log-likelihood	-1379.83	-1351.64	-1349.1	-965.93
χ^2	167.39***	223.76***	228.84***	317.93***
Samples	2353	2353	2353	2353

Notes: $n = 2,353$ firms. Standard errors are in parentheses. Industry effects are included in the models but not displayed here. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 4. Results of the Sobel tests of the mediating effects of innovation

Mediator	c	a	σ_a	b	σ_b	Z	Effect ratio
Business Process Innovation	0.04	0.08	0.00	0.18	0.00	10.5***	0.24

Note: $Z = a \times b / \sqrt{a^2 \sigma_b^2 + b^2 \sigma_a^2}$, effect ratio = $a \times b / c$. a is an independent variable's effect on a mediator, b is a mediator's effect on a dependent variable, and c is an independent variable's effect on a dependent variable.
*** $p < 0.001$ (two-tailed).

innovation performance. Through the analysis of Korean Innovation Survey data, the findings support the positive impact of collaboration with external firms on innovation performance, thus affirming Hypothesis 1. This supports the theoretical argument that collaboration, by providing access to a broader spectrum of knowledge and resources, can enhance firms' innovative capabilities. Furthermore, the positive effect of business process innovation on innovation performance (Hypothesis 2) underlines the critical role of internal processes in translating external knowledge into actionable innovation outcomes.

Most notably, this study elucidates the mediating role of business process innovation in the relationship between collaboration with external firms and innovation performance, thereby supporting Hypothesis 3. The statistical significance of this mediation effect, as demonstrated through logistic regression analysis and further validated by a Sobel test, highlights the importance of internalizing and optimizing external knowledge within organizations' processes to achieve innovation success. This finding implies that while external collaboration is vital for accessing new ideas and technologies, a firm's ability to innovate significantly depends on the capacity of its internal processes to integrate and apply this external knowledge effectively.

This study academically indicates that business process innovation acts as a crucial intermediary that transforms knowledge and ideas from external collaborations into tangible innovation outcomes, enhancing operational efficiency. It enables the effective integration of external insights into organizations' frameworks, thereby cultivating groundbreaking methodologies and significantly impacting performance indicators. The ability of business process innovation to adapt and implement externally sourced knowledge into daily operations is essential for the productive management and realization of product innovation. By serving as a bridge between external innovation potential and internal execution, business process innovation ensures the practical application of new insights, thereby enhancing organizations' product innovation

capacity and competitive position. Additionally, firms must not only seek to collaborate with a variety of external partners but also continually innovate their business processes to fully leverage the potential benefits of such collaborations. This dual focus can enable firms to navigate the complexities of the modern business environment more successfully and sustain their competitive edge through innovation.

The practical implications of this study underscore the importance for organizations to strategically manage their external collaborations to maximize the inflow of diverse knowledge and resources, which enhances innovation capabilities. Effective management should include aligning these collaborations with firm-specific innovation goals and optimizing internal processes to ensure that insights gained are actionable. This involves revising workflows, adopting new technologies, and continuously innovating business processes to integrate and operationalize external knowledge effectively. By doing so, organizations can translate these collaborations into marketable innovations and maintain a competitive edge in the market.

Furthermore, the study highlights the crucial role of business process innovation as a mediator that transforms external collaboration benefits into tangible innovation outcomes. Organizations are encouraged to view business process innovation not just as an operational necessity but as a strategic component crucial for converting external knowledge into commercial success. This dual focus on nurturing external partnerships while innovating internal processes allows firms to navigate the complexities of the modern business environment, ensuring sustainable growth and a stronger competitive position through enhanced product innovation and operational efficiency.

This study also acknowledges the challenges inherent in managing external collaborations and the complexity of internalizing external knowledge within business processes. Future research could explore the specific mechanisms through which firms can optimize these collaborations and internal process innovations to enhance their innovation performance further. Additionally, examining the role of industry-specific factors and the impact of digital technologies

in facilitating these processes could provide greater insights into the multifaceted nature of innovation in contemporary business contexts.

This research, while significant, has limitations. It is based on data from SMEs (Small and medium-sized enterprises) in South Korea's manufacturing sector, thereby limiting its broader applicability. Collaboration dynamics and innovation processes may differ in other countries and service sectors, necessitating further research (Al Mansoori & Bakri, 2023). Additionally, this study did not account for various factors affecting SMEs' external knowledge search and its impact on innovation. Future studies should include a wider range of internal and external factors, such as firm culture, capabilities, and market or technological changes, to better understand the influence of external knowledge on firm performance.

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