

The Relation of R&D to Technological Innovation and the Moderating Effect of External Network and Institutional Investor's Stock Ownership

Su-Jung Hwang*

Department of Venture Startups, Keimyung University,
Daegu, Republic of Korea

— *Review of* —
**Integrative
Business &
Economics**
— *Research* —

ABSTRACT

This study empirically analyzed the impact of the R&D of SMEs on technological innovation and the moderating effect of external network and institutional investor's stock ownership on the relationship between R&D and technological innovation. This research model is designed based on existing research, and research hypotheses are established. For hypotheses testing, a survey was conducted on SMEs located in Daegu, Korea, and 289 data were used for analysis. As a result of the analysis, it is found that the R&D positively and significantly affects the technological innovation of SMEs. Also, external network and institutional investor's stock ownership positively moderate the relationship between R&D and technological innovation. Based on the result contributes to the theoretical and practical implications.

Keywords: R&D, External Network, Institutional Investor's Stock Ownership, Technological Innovation.

Received 17 October 2023 | Revised 11 February 2024 | Accepted 18 March 2024.

1. INTRODUCTION

As the business environment becomes more dynamic and complex and unpredictability increases, innovation's importance to strengthen corporate competitiveness is being emphasized more than ever. In particular, the argument for continuous technological innovation to secure a long-term competitive advantage while actively coping with the company's ever-shortening product life cycle and new business opportunities (Conceico *et al.*, 2002) is gaining great traction. Innovation has been recognized primarily by researchers and practitioners as an essential organizational tool to adapt to the ongoing evolution of market needs and maintain a company's long-term growth (Crossan & Apaydin, 2010). Therefore, innovation is the cornerstone of determining a company's profitability and growth potential and achieving a sustained competitive advantage (Mendoza-Silva, 2021). The ability to innovate involves a degree of tacit knowledge that competitors cannot easily imitate or divert, which constitutes a unique mechanism for the company's benefit (Teece *et al.*, 2016).

Small and medium-sized enterprises are likely to fail in market competition due to lack of resources, lack of economies of scale, and lack of reputation. Therefore, the way for SMEs to survive under these conditions can be seen as strengthening their competitiveness through innovation so that competitors cannot easily imitate it. Technological innovation is essential for entering new markets to strengthen SMEs' competitiveness in today's business environment (Adams *et al.*, 2006). Innovation is

considered one of the most important means for improving performance and sustainable growth as it enables the development of new products to increase cost efficiency and meet customer needs (Adams *et al.*, 2006; McEvily *et al.*, 2022).

Innovation is crucial in strengthening SMEs' competitiveness in domestic and foreign markets (Lee *et al.*, 2001), contributing to performance improvement in many industries, especially strengthening companies' competitive advantage. According to a study by Do *et al.* (2023), technological innovation contributes to corporate performance through new product launches, product improvements, and changes in the production process. Small and medium-sized enterprises that reject innovation and creative change cannot survive long term (O'Regan *et al.*, 2006). Therefore, technological innovation is significant in strengthening the competitiveness of SMEs, and technological innovation is encouraged at the national policy level. However, research on technological innovation for SMEs is also lacking both domestically and internationally.

SMEs are putting much effort into considerable R&D investment and external networking to strengthen their competitiveness, and related research is also increasing significantly. Based on the results, R&D and CEO characteristics are suggested as essential factors. Although high R&D intensity does not necessarily guarantee successful technological innovation, small and medium-sized enterprises that invest heavily in R&D are likely to be competitive through innovation and technological development (O'Brien, 2003). Also, Keizer *et al.* (2002) argued that R&D can be the basis of a continuous competitive advantage for small and medium-sized enterprises that lack competency, which is an important challenge. Technological innovation positively affects corporate performance, and the company's internal capabilities and external environment are important factors that increase the company's technological innovation (Wong & Zhang, 2022).

Nevertheless, the results of existing studies on the impact of R&D on the technological innovation of SMEs are somewhat inconsistent, and the relationship between R&D and technological innovation has not been fully reviewed depending on moderating factors. Lin *et al.* (2006) mentioned that R&D of small and medium-sized enterprises can lead to technological innovation when complementary resources are sufficient, and Shoham and Fiegenbaum (2002) also stated that the relationship between R&D and technological innovation could be more accurate when it links with situational factors. In other words, SMEs cannot invest much in R&D because they lack resources and capabilities compared to large companies. Therefore, to supplement this for successful technological innovation, efforts to utilize external knowledge and technology through active cooperation with external companies and institutions are necessary, along with efforts to develop their technology (Kaufmann & Todtling, 2002; Leceta & Könnölä, 2021).

Through external networks, companies can effectively acquire new skills and knowledge and make the most of them to maximize innovation performance (Belso-Martínez *et al.*, 2020; Lee *et al.*, 2001). However, discussions on SMEs tend to be relatively insufficient in existing studies on external networks (West *et al.*, 2006). Moreover, the results of existing studies focusing on external networks are inconsistent. Studies with positive results only analyzed the independent effects of external networks on technological innovation performance, showing that studies that included the interaction effect are rare.

On the other hand, the ownership structure is important as a determinant of technological innovation, and innovation is likely when managers' share of stock ownership (Zahra *et al.*, 2000) and institutional investors' share of stock ownership (Boh *et al.*, 2020; David *et al.*, 2001). However, most of these studies target large companies and see only the independent effect of ownership structure on technological innovation.

Therefore, there is a limit to applying these findings to domestic SMEs, and if they are introduced as a moderating factor in research on R&D, a major determinant of technological innovation of domestic SMEs rather than the independent effect of ownership structure, it will be possible to identify the innovation mechanism of domestic SMEs more systematically.

In the case of small and medium-sized enterprises, institutional investors own stocks that are more difficult to control than managers and employees own stocks, and institutional investors' stock ownership will play a positive role in linking R&D to technological innovation. In other words, small and medium-sized enterprises (Saunila, 2020; Lee *et al.*, 2001) suffering from a lack of resources such as funds and manpower will more actively carry out R&D activities because institutional investor stock ownership is likely to decrease if there is no visible result through R&D. This is also because institutional investors support long-term value-creating activities such as R&D and corporate innovation of investment companies (Heij *et al.*, 2020; Zahra *et al.*, 2000) and provide active management consulting.

From this perspective, this study aims to examine how the R&D of domestic SMEs affects technological innovation and introduce external networks and institutional investor stock ownership as situational factors that can effectively link R&D to technological innovation. Therefore, the purpose of this study is as follows:

First, this study identifies the relationship between R&D and technological innovation of SMEs.

Second, it empirically investigates whether external networks moderate the relationship between SMEs' R&D and technological innovation.

Third, we examine whether institutional investor stock ownership plays a moderating role in the relationship between R&D and technological innovation of SMEs.

In other words, it empirically investigates whether the relationship between R&D and technological innovation varies depending on institutional investors' stock ownership level.

On the other hand, many researchers used product innovation as a major criterion in measuring technological innovation performance, although interest in process innovation was relatively insufficient (Becheikh *et al.*, 2006). Although product and process innovation are interdependent and highly relevant, they go through different processes, and the determinants are different (Michie & Sheehan, 2003; Sternberg & Arndt, 2001). Therefore, it is judged that more interest in process innovation is needed, and process and product innovation need to be considered separately. Therefore, in this study, technological innovation is measured by dividing it into product and process innovation.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Technological innovation is essential in strengthening the competitiveness, improving performance, and continuing growth of SMEs lacking resources and capabilities (Adams *et al.*, 2006; Saunila, 2020). Researchers and practitioners have recognized innovation as an important organizational tool to adapt to the ongoing evolution of market needs and maintain a company's long-term growth (Crossan & Apaydin, 2010). Thus, innovation is essential to assessing a business's profitability, capacity for expansion, and ability to maintain a competitive advantage (Mendoza-Silva, 2021). The capacity for innovation includes implicit knowledge that makes a business unique and challenging for rivals to copy (Teece *et al.*, 2016).

Accordingly, most small and medium-sized business managers adopt technological innovation as an important competitive strategy (O'Regan *et al.*, 2006; Oshima & Toma,

2023). In the study of Kitikunchotiwut (2020), innovation is defined as the characteristics of a company pursuing invention and development that forms new products and services, creative products and services, and high-tech processes.

Zahra, Neubaum, and Huse (2000) defined the introduction of new products or new processes to improve the competitiveness and profitability of a company by satisfying customer needs as technological innovation. Also, many studies (Freel, 2003; Lager & Horte, 2002; Michie & Sheehan, 2003; Sternberg & Arndt, 2001) argue that product innovation and process innovation go through different processes, and the determinants are not necessarily the same. Therefore, in this study, technological innovation is defined as developing new products and improving existing products, introducing new processes, and improving existing processes to improve corporate competitiveness by creating new markets and customers and meeting customer needs.

R&D is an essential variable that determines technological innovation performance (Keizer *et al.*, 2002; Shefer & Frenkel, 2005). A study by Becheikh *et al.* (2006), which systematically organized 108 empirical studies related to technological innovation, also showed that more than half of the studies introduced R&D as a significant explanatory variable for technological innovation, and 80% of them showed that R&D had a positive significant effect on technological innovation.

A study by Souitaris (2002) also argued that corporate R&D activities were viewed as the main source of innovation creation and were one of the most critical corporate activities related to innovation. Although SMEs' R&D activities do not necessarily guarantee successful technological innovation, SMEs that actively invest in R&D are likely to compete with other companies based on new technologies (Indrawati, 2020; O'Brien, 2003). Therefore, investment in R&D activities attracts and absorbs intellectual assets to organizations, increasing the possibility of technological innovation by creating valuable goods or services (Dheera-aumpon, 2024).

At the root of a company's successful innovation activities, the inflow of new resources that stimulate innovation is essential. Since there is a limit to high performance by utilizing only the resources within the organization, it is inevitable to explore the necessary resources and capabilities outside the organization. As such, organizational innovation requires collecting and analyzing information on external environmental factors, and the more active these activities are, the higher the innovation success rate. In a market with strong positive network effects, innovators can increase their market share rapidly, and their products can become industry standards (Lin & Chen, 2005; Saunila, 2020).

For a company's successful technological innovation, it is necessary to increase innovation efficiency by actively utilizing ideas or research results through linkage with related external institutions. Interaction with external networks has a positive effect on a company's technological innovation performance (Belso-Martínez *et al.*, 2020), and companies can increase innovation performance by overcoming differences in resources and capabilities through interactions with the outside world (Romijn & Albaladejo, 2002). Therefore, it is important to analyze the interaction effects of external networks.

The influence of institutional investors in the capital market is constantly increasing (Boh *et al.*, 2020; David *et al.*, 2001). In this regard, there are views that institutional investors prefer investments that enable short-term profits rather than long-term investments, and there are views that they invest with interest in maximizing long-term corporate value. From the latter perspective, Kochhar and David (1996) argued that institutional investors do not invest for short-term profits but analyze all available information and carefully evaluate various alternatives to realize the highest long-term

benefits. Therefore, institutional investors prefer R&D investments that enhance corporate value in the long run and use their voices to force managers to invest in R&D.

However, according to a study by Kim (2003), which analyzed the relationship between ownership structure and R&D investment from the perspective of agent theory on 159 listed companies in Korea between 1999 and 2002, the impact of institutional investors was not significant. As such, the impact of institutional investor stock ownership on R&D seems inconsistent, and the impact of institutional investor stock ownership on technological innovation is inconsistent. Becheikh *et al.* (2006) systematically summarized 108 empirical studies related to technological innovation for manufacturing companies from 1993 to 2003, and the variables that showed inconsistent results in this study are shown in Figure 1.

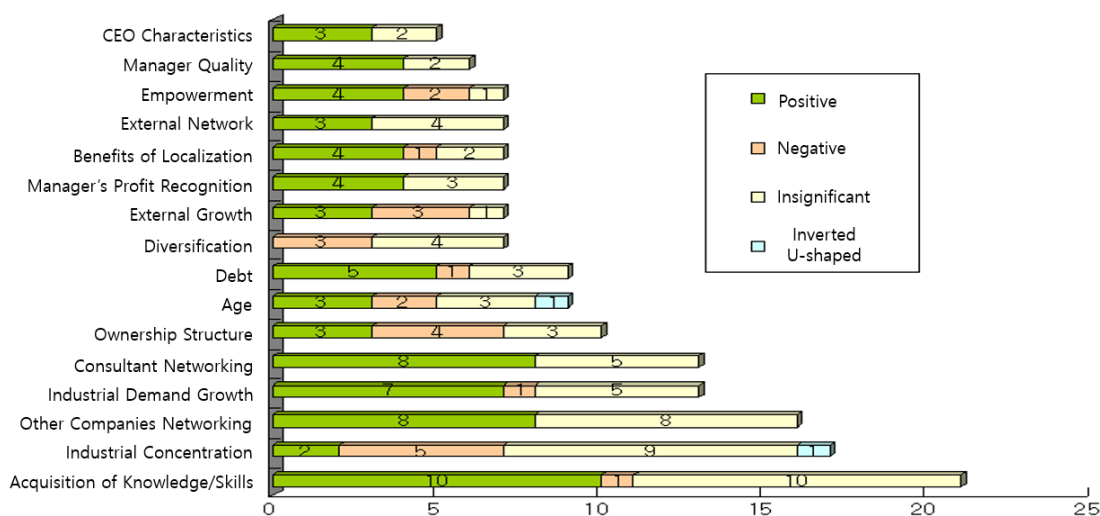


Figure 1. Innovation-related Variables
 Source: Author redesigns based on previous studies

Particularly, in the case of ownership structure, it can be seen that the number of studies that showed positive, negative, and non-significant results is almost the same. Therefore, it is necessary to look at the ownership structure as a moderating factor in studying the determinants of technological innovation rather than the independent effect on technological innovation. In the case of small and medium-sized enterprises, institutional investors own stocks that are more difficult to control than managers and employees own stocks, and institutional investors' stock ownership plays a significant role in linking R&D to technological innovation. In other words, small and medium-sized enterprises (Indrawati, 2020; Lee *et al.*, 2001) suffering from a lack of resources such as funds and manpower will more actively carry out R&D activities because institutional investor stock ownership is likely to decrease if there is no visible result through R&D. In addition, institutional investors support long-term value-creating activities such as corporate innovation (Boh *et al.*, 2020; Zahra *et al.*, 2000) and provide active management consulting for investment companies, so the impact of R&D on technological innovation will vary considerably depending on the proportion of institutional investors' stock ownership. Based on the ongoing discussion, the following hypotheses are suggested:

- H1. R&D investment has a positive effect on technological innovation.
- H2. External networks moderate the relationship between R&D investment and technological innovation.

H3. Institutional investor's stock ownership moderates the relationship between R&D investment and technological innovation.

3. RESEARCH METHODOLOGY

3.1 Measurement of Variables

In this study, a self-report questionnaire was conducted for the efficiency and ease of investigation. However, to reduce the common method bias that can occur when the independent variable and the dependent variable are measured by the same measurement tool and the respondent, the independent variable is a subjective measurement, and the dependent variable is answered with objective data (number of new product introductions). In addition, the respondents were not aware of the relationship between the measurement variables through questionnaire signs (psychological separation), and the order of the measurement items was arranged differently.

3.1.1 R&D

In this study, R&D was considered "the proportion of the amount used for R&D out of total sales," and "the proportion of R&D investment to sales over the past three years" (Hall and Bagchi-Sen, 2002) was measured.

3.1.2 External Network

External network was measured on a 5-point scale with two questions, 'the degree of linkage and utilization with external organizations of the company.'

3.1.3 Technological Innovation

Technological innovation was defined as "developing new products and improving existing products to improve corporate competitiveness by creating new markets and customers and satisfying customer needs," and the measurement was "the number of new product developments and improvements in existing products over the past three years (Becheikh *et al.*, 2006)."

3.1.4 Institutional Investor's Stock Ownership

Institutional investor's stock ownership was measured as 'the proportion of stocks owned by institutional investors among all stocks of a company' (Brickley *et al.*, 1998).

3.1.5 Control Variables

As control variables, company size (Cosh & Hughes, 2000; Hall & Bagchi-Sen, 2002) and company age (Sorensen & Stuart, 2000) were introduced as factors that could affect technological innovation in previous studies.

3.2 Data Collection

A total of 289 data were collected by conducting a survey of manufacturing companies in Daegu with sales of more than 3 billion won between 2020 and 2022. Among them, 211 companies were used for the final analysis, excluding companies whose responses to the survey were unfaithful or unreliable, and companies with fewer than 5 employees or more than 299.

3.3 Hypotheses Test

3.3.1 Correlation Analysis

Table 1 shows the correlation of each variable. As can be seen from this table, technological innovation was found to be significant in a positive relationship with age, size, R&D, external networks, and institutional investor's stock ownership, and did not show a significant relationship with firm age.

In addition, in the case of multiple regression analysis conducted to verify the hypothesis, the multicollinearity problem is likely to occur, but there was no multicollinearity based on the correlation coefficient between variables.

Table 1. Correlation Analysis

	Mean	SD	1	2	3	4	5
1. Firm Age	15.308	9.072					
2. Firm Size	1.548	.384	.224**				
3. R&D	9.051	10.821	.077	.096			
4. External Network	2.916	.870	-.133*	.082	.177*		
5. Institutional Investor's Stock Ownership	7.667	7.168	-.056	.106	.018	.339**	
6. Technological Innovation	5.715	7.532	.112	.234***	.193***	.235***	.321***

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$

This study aims to analyze the relationship between R&D and technological innovation while controlling firm size and age, and the moderating effect of external network and institutional investor's stock ownership on the relationship between them. Multicollinearity can occur because the interaction term is included in the moderating effect test. Therefore, in this study, mean centralization was used to solve the multicollinearity problem, and mean centralization increases the accuracy and stability of the estimate by reducing the standard error. Therefore, regression analysis was performed after centralization, and multicollinearity was diagnosed through tolerance and variance inflation factors. As a result of the diagnosis, it was found that the tolerance limit (more than 0.1) and the variance inflation coefficient (less than 10) were not at the level of suspicion of multicollinearity.

3.2 Regression Analysis

This study aims to understand the relationship between R&D and technological innovation while controlling age and size, and the moderating role of external networks and institutional investors' stock ownership on the relationship between them. Regression analysis was performed to verify the hypothesis, and the results are shown in Table 2.

For Model 2, which invested independent variables such as age, size, and R&D, the research model was significant ($F = 14.949$, $p < .01$), and R^2 also increased significantly compared to Model 1 ($\Delta R^2 = .160$, $p < .01$). R&D was found to have a positive significant relationship with technological innovation (Hypothesis 1 is supported).

Model 4 introduced the interaction term between R&D investment and external networks, and the research model was significant ($F = 14.661$, $p < .01$), and R^2 also increased significantly compared to Model 3 ($\Delta R^2 = .039$, $p < .05$). It was also found that the interaction term between R&D and external networks showed a positive significant relationship with technological innovation (Hypothesis 2 is supported).

Model 6 introduced the interaction term between R&D investment and institutional investor stock ownership, and the model was significant ($F = 74.802$, $p < .01$), and R^2 also increased significantly compared to Analysis Model 5 ($\Delta R^2 = .011$, $p < .05$). It was also found that the interaction term between R&D and institutional investor's stock ownership had a positive significant relationship with technological innovation. Therefore, institutional investor's stock ownership positively moderates the relationship between R&D and technological innovation (Hypothesis 3 is supported).

Table 2. Regression Result

	Dependent Variable: Technological Innovation					
	Model 1 [N=211] (H1)	Model 2 [N=211]	Model 3 [N=211]	Model 4 [N=211] (H2)	Model 5 [N=211] (H2)	Model 6 [N=211] (H3)
Control						
Firm Age	.198*	.236*	.206*	.227**	.064	.079
Firm Size	.073	.126	.089	.101	.057	.050
Independent						
R&D		.406**	.359**	-.680	.234**	.097
External Network			.246**	.037		
Institutional Investor's Stock Ownership					.727**	.591**
Interaction						
R&D * EN				1.112*		
R&D * IISO						.236*
Regression Result	F=4.546* R ² =.051 Adjusted R ² =.040	F=14.949** R ² =.211 Adjusted R ² =.197 Model 1 ΔR^2 =.160**	F=15.203** R ² =.267 Adjusted R ² =.249 Model 2 ΔR^2 =.056**	F=14.661** R ² =.306 Adjusted R ² =.285 Model 3 ΔR^2 =.039*	F=89.232** R ² =.681 Adjusted R ² =.674 Model 3 ΔR^2 =.471**	F=74.802** R ² =.693 Adjusted R ² =.683 Model 3 ΔR^2 =.011*

Notes: * $p < .05$, ** $p < .01$

4. CONCLUSION

4.1 Summary and Implications

This study empirically investigated the effect of R&D on technological innovation and the moderating effect of external network and institutional investor's stock ownership on the relationship between them. The results are summarized as follows.

First, SMEs' R&D has a positive and significant impact on technological innovation.

Second, the moderating effect of the external network on the relationship between R&D and technological innovation of SMEs is positively significant.

Third, the institutional investor's stock ownership positively and significantly moderates the relationship between SMEs' R&D and technological innovation. In other words, the more institutional investors own shares, the greater the effect of R&D on technological innovation.

In addition, for a company's successful technological innovation, it is necessary to increase innovation efficiency by actively utilizing ideas and research results through

linkage with related external organizations. The results of this study were also found to support existing research results. Since SMEs lack resources such as funds, manpower, and technology, cooperative interaction with external organizations is important to promote technological innovation successfully. Therefore, SMEs managers should be able to connect the acquired technology and information to the company's technological innovation performance by establishing an internal system that can access external networks and strategically utilize them.

Moreover, in inducing SMEs' R&D to technological innovation, institutional investor's stock ownership tended to control. In other words, the relationship between R&D and technological innovation changed depending on the level of institutional investor's stock ownership of SMEs. Specifically, it was shown that technological innovation is increasing more significantly as R&D increases when institutional investor's stock ownership of SMEs is higher than when it is at a low level.

The interaction between R&D and institutional investor's stock ownership has a positive effect because institutional investors support long-term value-creating activities such as R&D (Kochhar & David, 1996) and corporate innovation (Zahra, 1996) and provide active management consulting for investment companies. In addition, SMEs (Lee *et al.*, 2001) suffering from a lack of resources such as funds are likely to reduce their stock ownership of institutional investors if there is no visible result through R&D, so they carry out more active R&D activities. Therefore, SMEs need to actively attract institutional investors to own stocks. This study suggests that it increases management's risk-taking behavior and enables employees' immersion and various support from institutional investors.

Since SMEs face difficulties in market failure due to a lack of resources and capabilities, it is essential to strengthen innovation activities to secure a competitive advantage. This study provides implications for ways to increase the efficiency of R&D investment through the results of research on local SMEs in a situation where empirical research on them is insufficient.

In addition, the results of this study are useful in establishing technological innovation strategies to strengthen the competitiveness of local SMEs and used as basic data for establishing policy alternatives to support technological innovation for small and medium-sized enterprises by the government and public institutions.

4.2 Limitations and Future Research Directions

The following limitations should be considered in interpreting the results of this study and accepting significance and implications.

First, it is known that there are differences in research results and significance related to R&D and innovation depending on how the research sample is selected. This study is limited to SMEs in Daegu. Furthermore, the industry is also limited to representative industries (fiber, mechatronics, metals, etc.), so it is difficult to say that it represents the characteristics of Korean SMEs.

Second, it does not consider the effects of other internal factors (culture, strategy, organizational structure, etc.) related to the technological innovation of SMEs. Moreover, it appears that the technological innovation of SMEs is affected by internal factors such as government support and others. However, this study does not consider the effects of these variables as a whole.

Third, by measuring the number of product improvements and new product introductions due to technological innovation, the results of various technological innovations (number of new processes introduced, number of patents, etc.) are not

reflected. Therefore, future studies should be conducted to overcome the limitations of this study.

ACKNOWLEDGEMENTS

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2022S1A5B5A17043587). Thanks to the anonymous reviewer for his/her helpful comments and suggestions.

REFERENCES

- [1] Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, 8(1), 21-47.
- [2] Audretsch, D. B. (2001). The role of small firms in U.S. biotechnology clusters. *Small Business Economics*, 17(1/2), 3-15.
- [3] Becheikh, N., Landry, R., & Amara, N. (2006). Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003. *Technovation*, 26(5), 644-664.
- [4] Belso-Martínez, J. A., Mas-Verdu, F., & Chinchilla-Mira, L. (2020). How do interorganizational networks and firm group structures matter for innovation in clusters: Different networks, different results. *Journal of Small Business Management*, 58(1), 73-105.
- [5] Boh, W. F., Huang, C. J., & Wu, A. (2020). Investor experience and innovation performance: The mediating role of external cooperation. *Strategic Management Journal*, 41(1), 124-151.
- [6] Conceicao, P., Hamill, D., & Pinheiro, P. (2002). Innovative science and technology commercialization strategies at 3M: A case study. *Journal of Engineering and Technology Management*, 19(1), 25-38.
- [7] David, P., Hitt, M. A., & Gimeno, J. (2001). The influence of activism by institutional investors on R&D. *Academy of Management Journal*, 44(1), 144-157.
- [8] Dheera-aumpon, S. (2024). Home-Country R&D and Productivity Spillovers from FDI in Thailand. *Review of Integrative Business and Economics Research*, 13(1), 43-50.
- [9] Do, H. N., Do, L. C., Tran, M. D., Dao, A. T. A., & Tran, T. T. D. (2023). The Impact of Technological Innovation on the Performance of Vietnamese Firms. *Iranian Journal of Management Studies*, 16(1), 299-321.
- [10] Eisenhardt, K. M., & Brown, S. L. (1999). Patching. Restitching business portfolios in dynamic markets. *Harvard Business Review*, 77(3), 71-82.
- [11] Freel, M. S. (2000). External linkages and product innovation in small manufacturing firms. *Entrepreneurship & Regional Development: An International Journal*, 12(3), 245-266.
- [12] Heij, C. V., Volberda, H. W., Van den Bosch, F. A., & Hollen, R. M. (2020). How to leverage the impact of R&D on product innovation? The moderating effect of management innovation. *R&D Management*, 50(2), 277-294.
- [13] Indrawati, H. (2020). Barriers to technological innovations of SMEs: how to solve them?. *International Journal of Innovation Science*, 12(5), 545-564.
- [14] Kaufmann, A., & Todtling, F. (2001). Science-industry interaction in the process of innovation: The importance of boundary-crossing between systems. *Research*

- Policy, 30(5), 791-804.
- [15] Keizer, J. A., Dijkstra, L., & Halman, J. I. M. (2002). Explaining innovative efforts of SMEs: An exploratory survey among SMEs in the mechanical and electrical engineering sector in the Netherlands. *Technovation*, 22(1), 1-13.
- [16] Kim, K. M. (2003). Corporate Governance Structure and Innovation: The Influence of Ownership Structure on R&D Investment. *Korean Management Review*, 32(6), 1799-1832.
- [17] Kochhar, R. & David, P. (1996), Institutional Investors and Firm Innovation: A Test of Competing Hypotheses, *Strategic Management Journal*, 17(1), 73-84.
- [18] Lager, T., & Horte, S. A. (2002). Success factors for improvement and innovation of process technology in process industry. *Integrated Manufacturing Systems*, 13(3), 158-164.
- [19] Leceta, J. M., & Könnölä, T. (2021). Fostering entrepreneurial innovation ecosystems: Lessons learned from the European Institute of Innovation and Technology. *Innovation: The European Journal of Social Science Research*, 34(4), 475-494.
- [20] Lee, C., Lee, K., & Pennings, J. M. (2001). Internal capabilities, external networks, and performance: A study on technology-based ventures. *Strategic Management Journal*, 22(6/7), 615-540.
- [21] Lin, B. W., & Chen, J. S. (2005). Corporate technology portfolios and R&D performance measures: A study of technology intensive firms. *R&D Management*, 35(2), 157-170.
- [22] Lin, B. W., Lee, Y., & Hung, S. C. (2006). R&D intensity and commercialization orientation effects on financial performance. *Journal of Business Research*, 59(6), 679-685.
- [23] McEvily, S. K., Eisenhardt, K. M. M., & Prescott, J. E. (2004). The global acquisition, leverage, and protection of technological competencies. *Strategic Management Journal*, 25(8/9), 713-722.
- [24] Mendoza-Silva, A. (2021). Innovation capability: A systematic literature review. *European Journal of Innovation Management*, 24(3), 707-734.
- [25] Michie, J., & Sheehan, M. (2003). Labour market deregulation, 'flexibility' and innovation. *Cambridge Journal of Economics*, 27(1), 123-143.
- [26] O'Brien, J. P. (2003). The capital structure implications of pursuing a strategy of innovation. *Strategic Management Journal*, 24(5), 415-431.
- [27] O'Regan, N., Ghobadian, A., & Sims, M. (2006). Fast tracking innovation in manufacturing SMEs. *Technovation*, 26(2), 251-261.
- [28] Oshima, Y., & Toma, T. (2023). The Product Innovation Process with the Use of Mediators for Collaboration: The Case of Japanese Traditional Local Industry. *Review of Integrative Business and Economics Research*, 12(3), 50-69.
- [29] Romijn, H., & Albaladejo, M. (2002). Determinants of innovation capability in small electronics and software firms in Southeast England. *Research Policy*, 31(3), 1053-1067.
- [30] Saunila, M. (2020). Innovation capability in SMEs: A systematic review of the literature. *Journal of Innovation & knowledge*, 5(4), 260-265.
- [31] Shefer, D., & Frenkel, A. (2005). R&D, firm size, and innovation: An empirical analysis. *Technovation*, 25(1), 25-32.
- [32] Shoham, A. and Fiegenbaum, A. (2002). Competitive determinants of organizational risk-taking attitude: The role of strategic reference points. *Management Decision*, 40(2), 127-141.
- [33] Souitaris, V. (2002). Firm-specific competencies determining technological

- innovation: A survey in Greece. *R&D Management*, 32(1), 61-77.
- [34] Sternberg, R., & Arndt, O. (2001). The firm or the region: What determines the innovation behaviour of European firms? *Economic Geography*, 77(4), 364-382.
- [35] Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13–35.
- [36] Verhees, J. H. M., & Meulenbergh, M. T. G. (2004). Market orientation, innovativeness, product innovation, and performance in small firms. *Journal of Small Business Management*, 42(2), 134-154.
- [37] West, J., Vanhaverbeke, W., & Chesbrough, H. (2006). Open innovation: A research agenda. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *Open innovation: Researching a new paradigm* (1-12). New York: Oxford University Press.
- [38] Wong, J. B., & Zhang, Q. (2022). Stock market reactions to adverse ESG disclosure via media channels. *The British Accounting Review*, 54(1), 101045.
- [39] Zahra, S. A., Neubaum, D. O., & Huse, M. (2000). Entrepreneurship in Medium-Size Companies: Exploring the Effects of Ownership and Governance Systems. *Journal of Management*, 26(5), 947-976.