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MANAGEMENT

Enhancing Innovation through Absorptive Capacity: The Moderating Role of Intellectual Capital

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ABSTRACT

Purpose: This study aims to investigate the impact of absorptive capacity on innovation within non-cyclical manufacturing companies in Indonesia and to examine the moderating role of intellectual capital.

Method: The study employed a quantitative descriptive methodology, analyzing 176 data points derived from the annual financial statements of 38 non-cyclical manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. The sample was selected through purposive sampling based on specific criteria pertinent to the research objectives. Regression analysis was conducted using Stata, applying main and moderation models under fixed effects (as determined by the Hausman test), while passing diagnostic tests for heteroscedasticity and serial correlation to ensure validity and reliability.

Result: The findings indicate that absorptive capacity significantly enhances innovation. Human capital and structural capital exert a positive and significant influence on innovation, whereas physical capital does not demonstrate a statistically significant direct effect. Nevertheless, the interaction of absorptive capacity with both structural capital and physical capital significantly bolsters innovation. Conversely, the interaction between absorptive capacity and human capital presents a negative moderating effect.

Practical Implications for Economic Growth and Development: This study confirms that enhancing absorptive capacity, supported by intellectual capital, can improve innovation in non-cyclical manufacturing companies, ultimately strengthening industrial productivity and contributing to national economic growth.

Originality/Value: This study provides an original contribution by empirically examining the moderating role of intellectual capital in the relationship between absorptive capacity and innovation, framed within the Resource-Based View theory.

Keywords: *Absorptive Capacity, Innovation, Intellectual Capital, Manufacturing Sector, Resource-Based View*

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INTRODUCTION

The manufacturing industry has experienced substantial transformations globally, including in Indonesia. Innovation serves as the primary driver enabling the manufacturing sector to navigate digital transformation, particularly within the non-cyclical segment, which represents a significant component of the economy. Nevertheless, Indonesia's low Global Innovation Index (GII) score in 2024 indicates a limited contribution of innovation to the growth of the manufacturing industry. According to the World Intellectual Property Organization (WIPO) report, Indonesia achieved a score of 30.6, markedly trailing behind Southeast Asian counterparts such as Singapore (61.2), Malaysia (40.5), and Thailand (DataIndonesia.id, 2024). The weak state of innovation underscores the necessity for substantial enhancement, particularly regarding the optimization of a company's internal and external capabilities in knowledge absorption and management to generate sustainable innovative advantages. This challenge necessitates that companies maintain their operations by continually innovating their products and technologies, as innovation is critical for business success concerning cost, quality, and time (Marshella & Dewi, 2025).

A pertinent conceptual framework for addressing these challenges is the strengthening of Absorptive Capacity (ACAP), which posits that absorptive capacity is not exclusively developed through internal corporate activities, such as internal research and development (R&D), but is also significantly influenced by the efficacy of organizations in identifying, acquiring, and integrating knowledge from external sources (Lau & Lo, 2015; Denicolai et al., 2016). Absorptive capacity plays a crucial role in formulating innovation strategies that leverage external knowledge as a strategic asset (Müller et al., 2020). Collaborating with suppliers, technology partners, universities, or other research institutions represents a viable method for engaging with external entities. Such collaborations enhance absorptive capacity by showcasing skills and knowledge, ultimately fostering further innovation (Kerstin, 2019; Barham et al., 2020; Zhao et al., 2022).

Absorptive capacity cannot function in isolation; it must be influenced by the quality of a company's intangible resources, collectively referred to as Intellectual Capital (IC). By optimizing knowledge resources, improving process efficiency, and enhancing innovative capabilities, Intellectual Capital is vital for value creation and the prosperity of companies (Pratama et al., 2019). Human capital (HC), structural capital (SC), and physical capital (PC) constitute the three fundamental components of IC, as identified in various studies (Bontis et al., 2006; Kamath, 2007; Kang & Snell, 2009; Daat et al., 2021). Consequently, the presence of intellectual capital is anticipated to augment the capacity for absorptive capacity, serving as a mechanism for adaptation and change to sustain a competitive advantage and facilitate innovative activities (Thi et al., 2024). Companies that effectively control and utilize their resources can achieve optimal performance outcomes (Pratama et al., 2020; Pratama, Pratama, et al., 2024).

Previous studies, such as Mahmood and Mubarik (2020), have highlighted the role of intellectual capital—comprising human, structural, and relational capital—in facilitating organizational ambidexterity, defined as the capacity to balance the exploitation and exploration of innovation. Furthermore, technology absorption capacity (TAC) has been established as a mediator in this relationship. Similarly, Truong and Nguyen (2024) emphasize the direct contribution of intellectual capital to enhancing absorptive capacity, which subsequently drives business performance through innovation and environmental compliance. This perspective expands the understanding of the resource-based view (RBV) within the context of developing countries, such as Vietnam. Hutabarat et al. (2024) further underscore the urgency of intellectual capital and absorptive capacity for micro, small, and medium enterprises (MSMEs) in optimizing ecosystem-based innovation during the Industry 4.0 era, identifying absorptive capacity as a crucial factor that enables the effective utilization of intellectual capital to foster collaboration and innovative solutions. Collectively, these studies indicate a robust discourse surrounding the roles of intellectual capital and absorptive capacity in enhancing innovation across various sectors and conditions. However, there remains a paucity of research specifically examining how intellectual capital can function as

a moderating variable in strengthening the relationship between absorptive capacity and innovation, thereby presenting opportunities for further investigation.

In the present study, intellectual capital is posited as a moderating variable, as its role in this capacity has been inadequately explored in prior research, thus creating both a theoretical and empirical gap that this study seeks to address. The focus is specifically on non-cyclical manufacturing companies, selected for their perceived high quality and efficiency pressures. Utilizing longitudinal data from the company's financial statements spanning five years (2019–2023), the study employs an analytical approach that facilitates a comprehensive examination of the dynamics among variables over time, thereby providing a deeper understanding of their interrelations. This methodology allows for a nuanced exploration of how variables evolve, thereby enhancing comprehension of the phenomena under investigation. The study employs moderated interaction models and linear regression analysis to rectify shortcomings identified in previous research.

The primary objective of this study is to ascertain how absorptive capacity and intellectual capital contribute to the enhancement of innovation. The findings are anticipated to shed light on the roles of absorptive capacity and intellectual capital in supporting innovation. Additionally, the practical implications of this research offer guidance for manufacturing companies within the non-cyclical sector in formulating effective and sustainable innovation strategies, particularly given the industry's relatively stable characteristics amidst ongoing exposure to intense global competition.

Hypotheses Development

Absorptive Capacity and Innovation

Absorptive capacity is regarded as a pivotal organizational competency for adapting to Industry 4.0, as it significantly impacts firms' technological and innovation endeavors (Mahmood & Mubarik, 2020; Saiz et al., 2018; Müller et al., 2020). Competitive advantage is derived from innovation performance, which is shaped by two critical factors: first, the manner in which existing knowledge is integrated to foster innovation; and second, the processes through which economic actors identify new knowledge (Capaldo & Messeni Petruzzelli, 2015). Consistent with the Resource-Based View (RBV) theory, absorptive capacity serves not only as a catalyst for innovation but also as a source of competitive advantage that enhances innovative capabilities.

H1: Absorptive capacity has a positive effect on innovation

Human Capital and Innovation

Employees' abilities, attitudes, and cognitive intelligence collectively constitute human capital (HC), which is a critical component of organizational knowledge. HC is foundational to fostering innovation, as research indicates a direct correlation between a company's level of innovation and the quality of its workforce's knowledge, skills, experience, and motivation (Pratama & Innayah, 2023). The significance of HC in promoting innovation is well-documented in the literature (Fonseca et al., 2019; Kusumawijaya & Astuti, 2023; Hafiluddin & Widiastuti, 2025). According to the Resource-Based View (RBV) theory, HC is regarded as a strategic asset that enables organizations to maintain a sustainable competitive advantage. Furthermore, in the context of evolving market dynamics and technological advancements, RBV facilitates enhanced creativity within organizations.

H2: Human capital has a positive effect on innovation

Structural Capital and Innovation

Structural capital (SC) encompasses explicit knowledge, organizational culture, databases, systems, innovation, product development, quality management, information technology, as well as patents, manuals, and procedures that contain confidential information (Abualoush et al., 2016). Fueled by corporate innovation, effective systems, procedures, databases, and technology serve as vital components of SC, thereby facilitating the innovation process and enhancing the company's competitiveness (Pratama et al., 2023; Wirawan et al., 2017; Dat et al., 2023). When integrated with innovation, SC can substantially enhance technology, services, and processes, while also addressing public demand (da Silva et al., 2021). According to Resource-Based View (RBV) theory, SC functions as a systemic entity within an organization that amalgamates individual skills and external connections into a cohesive and structured approach to innovation.

H3: Structural capital has a positiive effect on innovation

Physical Capital and Innovation

Physical capital serves as a fundamental driver of economic growth by employing various mechanisms that enhance productivity, efficiency, and the adoption of technology, thereby accelerating the innovation process across all economic sectors (Li et al., 2024). Additionally, physical capital contributes to the establishment of an enabling environment for both domestic and foreign investment growth, which subsequently bolsters an economy's innovative capacity (Casi & Resmini, 2017). Firms that possess robust physical capital capabilities are better positioned to learn from experience, discern emerging trends, and adapt to changes in the market (Tisnawati, 2019; Alami & Mohammad, 2024). In accordance with Resource-Based View (RBV) Theory, substantial physical capital constitutes a critical resource that can afford businesses a sustainable competitive advantage through its capacity to attract investment, foster innovation, and facilitate adaptation to change.

H4: Physical capital has a positive effect on innovation

Human Capital, Absorptive Capacity, and Innovation

Human capital possesses the capacity to enhance absorptive capacity within organizations characterized by elevated levels of knowledge and expertise, enabling them to interpret external information more profoundly and apply it innovatively in the creation of new value (Sancho-Zamora et al., 2022; Prihatna et al., 2024). Organizations with personnel who exhibit significant human capital are pivotal in transforming their capacity to assimilate external knowledge into a catalyst for innovation (Orporate et al., 2012). Furthermore, Resource-Based View (RBV) theory posits that human resource management (HRM) practices designed to attract, develop, and retain skilled employees will significantly augment a company's ability to absorb knowledge and foster innovation. These practices encompass training, career development, reward systems, and the cultivation of an organizational culture conducive to knowledge exchange.

H5: Human capital moderates the effect of absorptive capacity on innovation

Structural Capital, Absorptive Capacity, and Innovation

Structural capital enhances the dimension of absorptive capacity, with structural wealth exerting a more pronounced influence, particularly during the processes of acquisition, assimilation, and exploitation of knowledge. Specifically, a greater accumulation of structural wealth within an organization correlates with increased effectiveness in the reception of innovations (Albort-Morant & Henseler, 2018; Hutabarat et al., 2024). In a knowledge-based economy, the capacity for innovation is critical for organizations to sustain competitiveness, expand market reach, and achieve sustainable performance. Structural capital encompasses

organizational infrastructure, systems, procedures, and databases, thereby playing a pivotal role in fostering an environment conducive to the development and implementation of innovations (Lyu et al., 2022). According to the Resource-Based View (RBV) theory, absorptive capacity and structural capital are essential resources and capabilities that synergistically contribute to the generation of innovation and the attainment of competitive advantage.

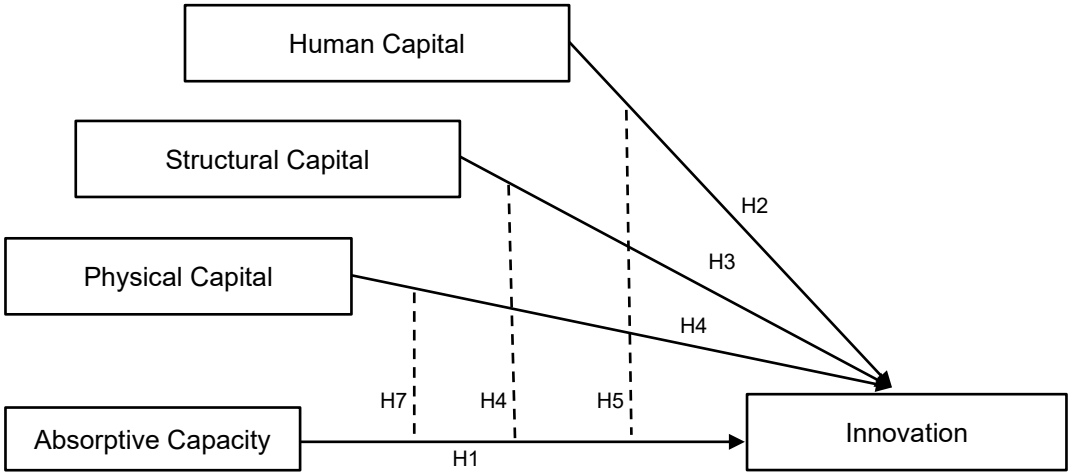
H6: Structural capital moderates the effect of absorptive capacity on innovation

Physical Capital, Absorptive Capacity, and Innovation

Physical assets that can be leveraged to foster innovations that enhance value encompass production equipment, technology, information technology systems, manufacturing infrastructure, and other supplementary facilities (Xu et al., 2023). According to the resource-based view, the value of physical capital amplifies the impact of absorptive capacity on innovation (Zou et al., 2018; Bawa & Yongping, 2024; Kastelli et al., 2024). This phenomenon occurs because organizations with sufficient physical infrastructure are better positioned to effectively integrate absorbed knowledge into innovative products or processes.

H7: Physical capital moderates the effect of absorptive capacity on innovation

Figure 1. Conceptual Framework



Source: Developed by the authors (2025)

METHOD

In this study, a quantitative descriptive approach was employed. The secondary data utilized originates from the annual financial statements of non-cyclical manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. The financial statements analyzed were required to be audited and officially published. A total of 38 out of 40 companies within the pertinent industries fulfilled the established criteria and were selected as samples. Additional criteria included consistent listing during the observation period, regular submission of audited annual financial reports, and the availability of complete data for all research variables. In total, 176 data points were analyzed from panel observations over the five-year observation period (38 companies × 5 years, excluding data that were unavailable or did not meet specific criteria). Stata software, recognized for its reliability in processing panel data regression models, was employed for data processing and analysis.

The regression model consists of two forms: the Main Effect Model (1) and the Moderation Model (2). The Main Effect Model indicates that innovation is directly influenced by absorptive

capacity (ACAP) and the three components of intellectual capital: human capital (HC), structural capital (SC), and physical capital (PC). Meanwhile, the Moderation Model was developed to investigate the moderating role of intellectual capital in either strengthening or weakening the relationship between absorptive capacity and innovation through the three aforementioned variables. By incorporating control variables, the model estimation results attain greater validity and accurately reflect the pure influence of the primary variables under investigation, as demonstrated in the two models presented below:

$$IN_{it} = \alpha + \beta^1 ACAP + \beta^2 HC + \beta^3 SC + \beta^4 PC + \beta^5 Size + \beta^6 Lev + \varepsilon \quad (1)$$

$$IN_{it} = \alpha + \beta^1 ACAP + \beta^2 HC + \beta^3 SC + \beta^4 PC + \beta^5 ACAP * HC + \beta^6 ACAP * SC + \beta^6 ACAP * PC + \beta^7 Size + \beta^8 Lev + \varepsilon \quad (2)$$

Where ACAP*HC, ACAP*SC, and ACAP*PC denote the moderating effects, and ε represents the error term.

Table 1. Operational Variables

Variable	Measurement	Source
Absorptive Capacity	$\frac{R\&D + TK + EK}{\text{Total Revenue}}$	(Muscio, 2007); (Cuevas-vargas et al., 2022) and (Awwad et al., 2025)
Innovation	$\frac{\text{Total R\&D}}{\text{Total Revenue}} \times 100\%$	Kinanti & Nuzula, 2017); (Pratama & Innayah, 2023); (Blundell et al., 2018) and (Pondrinal et al., 2022)
Intellectual Capital	$HCE_t + SCE_t + CEE_t$	(Pulic, 2004); (Ståhle et al., 2015) and (Pratama et al., 2019)
Size	$\ln$ Total Assets	(Dang et al., 2018) and (Pratama et al., 2022)
Leverage	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	(Frank & Goyal, 2009) and (Pratama & Putri, 2020)

Source: Compiled by the authors (2025)

RESULT AND DISCUSSION

Descriptive Statistics

The table of descriptive statistics presented below provides an overview of 176 observations utilized in this study. Both Innovation and Absorptive Capacity exhibit a minimum value of 0, indicating that certain companies did not demonstrate any innovation or capacity to assimilate external knowledge during the study period. The maximum value for both variables is 0.72, while the mean value for Innovation (IN) is 0.01 and for Absorptive Capacity (ACAP) is 0.02, accompanied by a standard deviation of 0.07 for each variable. This suggests that the overall levels of innovation and absorptive capacity are relatively low and consistent.

There is notable variability in the components of intellectual capital across firms. Human Capital (HC) displays a mean of 6.64 and a standard deviation of 5.28, reflecting considerable disparities in human resource efficacy among organizations. Structural Capital (SC) has an

average of 0.74, with a range from -1.65 to 0.96, indicating that some firms experience inefficiencies within their organizational structures. Physical Capital (PC) shows significant variability, with a maximum value of 16.90 and a mean of 1.05, highlighting substantial differences in the utilization of physical assets.

The Value Added Intellectual Coefficient (VAIC) has a mean of 8.43 and a standard deviation of 5.78, with a range extending from -1.23 to 33.14. According to Kamath's (2007) classification, VAIC is categorized into performance levels as follows: poor performer (< 2.5), average performer (2.5–4.0), proficient performer (4–5), and exceptional performer (> 5). The average VAIC of 8.43 positions the majority of firms within the top performer category, indicating a significant proficiency in managing intellectual capital capabilities. The presence of a negative minimum value suggests that, although the majority of firms operate efficiently, some organizations still lack adequate managerial systems, quality, or robust organizational infrastructure to fully capitalize on their intangible assets. Additionally, control variables, including size (mean = 29.78) and financial leverage (mean = 1.48), exhibit moderate variability in firm size and financial leverage.

Table 2. Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Deviation
Innovation	176	0.00	0.72	0.01	0.07
Human Capital	176	0.37	30.79	6.64	5.28
Structural Capital	176	-1.65	0.96	0.74	0.26
Physical Capital	176	-1.12	16.90	1.05	1.95
VAIC	176	-1.23	33.14	8.43	5.78
Absorptive Capacity	176	0.00	0.72	0.02	0.07
Size	176	27.42	32.85	29.78	1.30
Leverage	176	-2.12	23.41	1.48	2.68

Source: Processed by the authors (2025)

Hausman Test

Table 3 presents the findings of the Hausman test, employed to determine the most appropriate estimation method for Model 1 and Model 2. Each model is derived from a sample comprising 176 observations. Both models yield probability values (Prob > Chibar2) of 0.00, which is below the 5% significance level. This indicates that the null hypothesis, which posits that the random effects model is superior, can be rejected. Consequently, the alternative hypothesis is accepted, suggesting that the fixed effects model is more suitable for both models. The implication of these results is that the explanatory variables are associated with individual-specific heterogeneity, thereby ensuring that the fixed effects estimation provides consistent and unbiased results. These findings facilitate the selection of the optimal panel data estimation method, thereby enhancing the robustness of subsequent regression analyses.

Table 3. Hausman Test Result

Model	N	Prob>Chibar2	Conclusion
Model 1	176	0.00	Fixed Effect
Model 2	176	0.00	Fixed Effect

Source: Processed by the authors (2025)

Heteroscedasticity and Serial Correlation Tests

The results of the heteroscedasticity tests for Model 1 and Model 2, as presented in Table 4, indicate Prob > Chi2 values of 0.99 for both models. This probability exceeds the 0.05 significance threshold, suggesting that neither model exhibits issues related to

heteroscedasticity. Furthermore, the outcomes of the autocorrelation tests reveal no significant autocorrelation problems in either model. The Prob > F values are 0.08 for Model 1 and 0.21 for Model 2. Although Model 1 exhibits some weak indications of autocorrelation, these findings lack statistical significance. Both regression models satisfy the classical assumptions of non-autocorrelation and homoscedasticity, thereby confirming the reliability and utility of the parameter estimates generated by the models.

Table 4. Heteroscedasticity and Serial Correlation Tests

Model 1		**Model 2**	
Sample	176	Sample	176
Heteroscedasticity		**Heteroscedasticity**	
Chi2	14.88	Chi2	14.41
Prob> Chi2	0.99	Prob> Chi2	0.99
Serial Correlation		**Serial Correlation**	
F	3.22	F	1.58
Prob> F	0.08	Prob> F	0.21

Source: Processed by the authors (2025)

Hypotheses Testing

The results presented in Table 5 indicate that, within Model 1, human capital and structural capital have a significant positive effect on innovation, while physical capital shows no significant influence. Absorptive capacity emerges as the most dominant determinant, demonstrating a highly significant and positive impact on innovation. In Model 2, the moderating role of absorptive capacity is evident. Specifically, absorptive capacity negatively moderates the relationship between human capital and innovation, suggesting that when absorptive capacity is high, the contribution of human capital to innovation decreases. Conversely, absorptive capacity positively moderates the effects of structural capital and physical capital, strengthening their influence on innovation. These findings highlight the critical role of absorptive capacity, not only as a direct driver of innovation but also as a key moderator that alters the strength and direction of intellectual capital's contribution to innovation outcomes.

Table 5. Hypotheses Testing Result

Tested Hypotheses	**Coefficient**	**Std. Error**	**t**	**p-value**	**Conclusion**
Model 1					
HC → IN	0.0001	0.0000	2.67	0.011	Supported
SC → IN	0.0011	0.0005	2.33	0.026	Supported
PC → IN	-0.0009	0.0009	-1.05	0.302	Not Supported
ACAP → IN	0.9985	0.0006	1560.56	0.000	Supported
Model 2					
HC*ACAP → IN	-0.0381	0.0064	-6.00	0.000	Supported (Negative Moderation)
SC*ACAP → IN	0.0181	0.0029	6.31	0.000	Supported (Positive Moderation)
PC*ACAP → IN	0.0575	0.0166	3.46	0.001	Supported (Positive Moderation)

Source: Processed by the authors (2025)

Discussion

Absorptive Capacity and Innovation

The coefficient results indicate that the variables of absorptive capacity (ACAP) and innovation exhibit a near-perfect linear relationship. These findings corroborate prior research that demonstrates the significant impact of ACAP on innovation, both directly and indirectly through organizational learning (Mikhailov & Reichert, 2019; Sancho-Zamora et al., 2022; Arifin & Hartono, 2025). Additionally, another study revealed that all components of absorptive capacity—namely, acquiring, absorbing, transforming, and utilizing knowledge—substantially enhance innovation (Müller et al., 2020; Liu et al., 2021). This evidence aligns with the Resource-Based View (RBV) theory, which posits that knowledge constitutes a critical resource that must be effectively managed and developed through a constructive absorption process. Consequently, a minor alteration in absorptive capacity typically results in a proportional change in innovation.

Human Capital and Innovation

The positive coefficient indicates that an increase in human capital (HC) is associated with an increase in innovation. This finding corroborates prior research demonstrating that HC exerts a significant and positive effect on innovation. Specifically, studies by Pratama, Kamaluddin, et al. (2024), Alqershi et al. (2021), and Hafiluddin & Widiastuti (2025) have shown that the enhancement of internal knowledge, skills, and experience among employees correlates with elevated levels of strategic innovation within organizations. Furthermore, a higher investment in HC is linked to improved innovation outcomes at both the national and regional levels, as evidenced by the work of Cinnirella & Streb (2017), Fonseca et al. (2019), and Li et al. (2024). In accordance with Resource-Based View (RBV) theory, the effective management and development of HC as a strategic asset are essential for establishing and sustaining a competitive advantage in innovation. This underscores the notion that HC positively influences innovation, particularly in terms of investment, as investment in HC empowerment is a critical component of innovative activities.

Structural Capital and Innovation

The positive coefficient indicates a linear relationship between structural capital (SC) and innovation. This finding corroborates existing literature, such as that by Aljuboori et al. (2022), which posits that SC indirectly enhances organizational ambidexterity, thereby facilitating innovation. SC encompasses various elements, including work systems, intellectual property rights, management structures, and research and development (R&D) systems. According to Resource-Based View (RBV) theory, SC is regarded as a unique and difficult-to-imitate intangible asset that significantly bolsters the integration of innovation. Organizations with robust SC capabilities can develop continuous innovation processes and demonstrate heightened responsiveness to technological and market advancements (Wirawan et al., 2017; Dat et al., 2023; Truong & Nguyen, 2024). Consequently, the efficacy of a company's structure, internal systems, and organizational infrastructure is positively correlated with its capacity to generate innovation.

Physical Capital and Innovation

The negative and statistically insignificant coefficient indicates that physical capital (PC) does not exert a significant influence on innovation within the context of this study. This finding aligns with previous research that underscores the insufficiency of physical assets alone in fostering innovation, particularly when organizations lack the capacity to strategically manage, coordinate, and integrate these assets into the value creation process (Makhloufi et al., 2021; Brunello et al., 2022). According to the Resource-Based View (RBV), while PCs may contribute to innovation infrastructure, their role is primarily supportive rather than essential

for achieving innovation-driven excellence (Komakech et al., 2024). Consequently, PCs must be employed in conjunction with robust organizational and managerial capabilities. Competitors can readily acquire or replicate physical assets such as infrastructure, production equipment, or information technology, thereby diminishing the potential for sustained competitive advantage.

Moderating Role of Human Capital

The significant negative coefficient indicates that the relationship between human capital (HC) and absorptive capacity (ACAP) adversely impacts innovation. These findings corroborate prior research, particularly that of Lin (2014) and Guo et al. (2022), which illustrated that an excess of human capital can increase communication costs, diminish organizational cohesion, complicate decision-making processes, and escalate conflict or competition within the organization (Kwon & Rupp, 2013; Clercq & Thongpapanl, 2014; Chen et al., 2024). This outcome reinforces the resource-based view (RBV) theory, which posits that the possession of critical resources such as HC and ACAP can facilitate competitive advantage. However, it is equally essential to possess the necessary skills to effectively manage, align, and integrate these resources. Consequently, high levels of human capital may result in overqualification or misalignment of competencies, ultimately undermining the effectiveness of integrating external knowledge into the organization's innovation processes.

Moderating Role of Structural Capital

The positive coefficient indicates that the interaction between structural capital (SC) and absorptive capacity (ACAP) exerts a significant and beneficial influence on innovation. These findings corroborate previous research conducted by Wirawan et al. (2017), Wu et al. (2020), Shahzad et al. (2022), Abbas et al. (2024), and Hutabarat et al. (2024), which illustrates that an increased presence of supply chain capabilities within an organization enhances the effectiveness of absorptive capacity in fostering innovation. This outcome aligns with the Resource-Based View (RBV) theory, which posits that a firm's internal resources—such as systems, procedures, culture, and technology—serve as critical assets for establishing a competitive advantage through innovation. Consequently, a company's advanced internal systems, procedures, and technological infrastructure augment its capacity to assimilate external knowledge and drive innovative outcomes.

Moderating Role of Physical Capital

The positive coefficient indicates that the interaction between physical capital (PC) and Absorptive Capacity (ACAP) exerts a substantial and significant influence on innovation (Medase & Barasa, 2019; Kastelli et al., 2024). The findings suggest that while PC alone may not directly facilitate innovation, its effectiveness can be enhanced when combined with a robust capacity to absorb new information (Zou et al., 2018; Bawa & Yongping, 2024). These results are consistent with the Resource-Based View (RBV), which posits that an organization's ability to integrate and utilize resources, rather than merely possessing them, provides a sustainable competitive advantage. Consequently, manufacturing firms that excel in the acquisition, integration, and application of external knowledge are likely to achieve significant innovations by effectively leveraging physical assets, such as machinery, information technology systems, and production facilities.

CONCLUSION

This study investigates the influence of absorptive capacity on innovation and to examine the moderating role of intellectual capital, specifically human capital (HC), structural capital (SC), and physical capital (PC), within non-cyclical manufacturing companies in Indonesia. The

findings indicate that absorptive capacity has a significant positive effect on innovation. Additionally, structural and physical capital enhance this relationship, whereas human capital exhibits a negative moderating effect, suggesting potential misalignment in the management of human resources in relation to fostering innovation.

These findings offer important implications for both practitioners and policymakers. Organizations should aim to bolster structural capital through adaptive systems and organizational learning, while ensuring that human capital development aligns with innovation objectives. Furthermore, enhancing psychological readiness and promoting integrated skill-building are crucial. Future research is encouraged to examine additional industrial sectors and to incorporate external variables such as regulatory dynamics and technological advancements, thereby expanding the understanding of the drivers of innovation.

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