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Intellectual Capital and Long Term Competitive Advantage through Innovation Capability

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A B S T R A C T

Purpose: The focus of this study is to investigate how intellectual capital can generate sustained competitive advantage through innovation capability.
Method: The variance-based structural equation modeling (VB-SEM) technique is utilized in this study to examine a mediation model guided by strategic management theory.
Findings: We find that intellectual capital is an important strategic resource that positively influences firms' capacity to create innovation capability and long-term competitive advantage. Innovation capability is a dynamic force to turn knowledge-based resources to competitive outcomes that last longer. The findings also indicate that the direct effect of intellectual capital to long-term competitive advantage is enhanced by firms' ability to utilize innovation-related capabilities, which stresses the importance of developing capabilities rather than merely possessing resources. In sum, the model offers strong empirical justification for the theoretical unification of resource-based and dynamic capability views when accounting for sustained competitive advantage.
Novelty: This study provides a unique contribution by casting innovation capability as one composite mediator, which is an explicit link between intellectual capital and lasting competitive advantage consequently adding to existing research that has predominantly concentrated on short-term performance or fragmented measures of innovation.
Implications: Findings The research offers strategic implications for managers and policy makers, because it demonstrates the significance of setting IC management in line with innovation capability development toward sustainability competitiveness on a knowledge-based industry.

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1. Introduction

In today's knowledge economy, organizations compete based on the use and development of intangible resources more than tangible resources. Fast digitalization, convergence of technologies and increasing global competition have changed the nature of value creation by firms towards knowledge-based innovation and organizational capacity. Previous research has underlined that, intangible resources such as intellectual capital, learning capability and innovation-related

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capabilities have increasingly become the key driver of long-term firm performance (Audretsch et al., 2025; Liu et al., 2024; Teece, 2018; Zhang et al., 2025). This change becomes most apparent in the industries of services and knowledge, where not so much scale efficiency but proper commissioning of intellectual resources is decisive for competitive advantage. As a consequence, the conversion of knowledge stock to SCS has become an important research agenda for strategic management.

The banking industry is an important practical sample to investigate intellectual capital strategic role, since it primarily depends on knowledge and technology and personnel skill (Chen, 2026). Banks currently face an uncharted period of disruption as a result to digital banking transformation, fintech competition, increased regulatory oversight and evolving customer demands (Mishra et al., 2026). Recent research shows that the competitive performance of banks is becoming more closely related to their capacity of innovation in services, process and digital platforms than it is with the old rules associated only with balance sheet strength (Caputo et al., 2026; Heredia et al., 2023; Huang et al., 2026; Shi et al., 2025). In such context, intellectual capital is critical to sustain service quality, risk management, regulation compliance and innovation from continuous cooperation. Nevertheless, despite its acknowledged significance, empirical studies about how intellectual capital provides sources of sustainable competitive advantage to the banking industry are scant.

Theoretical backgrounds The RBT has as his main pillar the RBV which is based on four characteristics of resources valuable, rare, inimitable and non-substitutable (Barney, 1991; Gupta et al., 2018). By this way of thinking, the KBV adds that organizational knowledge is the strategically most important resource (Grant, 1996). More recently, Dynamic Capabilities Theory suggests that mere possession of strategic resources is not enough; firms need to be capable of integrating, reconfiguring and transforming those resources as a product of environmental change (Teece, 2007, 2018). IC commercialization as a core dynamic capability for firms to leverage on their IC in order to operationalize it into value. Previous research has added weight to the argument that innovation capability mediates between intellectual capital and long-term competitive advantage, particularly in industries undergoing digital transformation (Audretsch et al., 2015, 2025; Xu et al., 2023).

Despite the increasing number of studies on intellectual capital, innovation and competitive advantage, past empirical evidence is mixed concerning the relationship among these variables. There are also mixed findings about the direct and strong significant impact of intellectual capital on persistent performance (Nadeem et al., 2023) and weak or no effect when innovation related factors are controlled (Chandra et al., 2025; Smriti & Das, 2021). Recent studies, however, indicate that innovation capability fully or partially mediates this link; suggesting that IC has to be converted into organizational capabilities to create sustainable competitive advantages (Heredia et al., 2023; Huang et al., 2026). These inconsistent results bring up a major research void on the exact mediating role that process capability may perform as an all-inclusive single mediator. Furthermore, most of the previous literature investigates short-term financial performance or limited innovation proxies and there is little evidence on long-term competitive advantage (Liao, 2016). The present study bridges this shortcoming through the explicit consideration of innovation capability as a sole mediator on the relationship between intellectual capital and long-term competitive advantage, in bank sector.

Therefore, the aim of this paper is to analysis the direct impact of intellectual capital on long term competitive advantage, as well as its indirect influence through innovation capability. This study attempts to contribute to the strategic management literature by shedding light on the mechanisms that convert IC into sustainable competitive outcomes, having synthesized RBV, KBV and DCT in a combined empirical framework. The potential supply of the findings is addressed by reconciling past research discrepancies and proposing a more ability-based account of competitive advantage. Managerially, the paper offers some implications for bank managers and policy makers to better realize that integrating intellectual capital management with the development of innovation capabilities becomes a

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strategic tool for improving long-term competitiveness in knowledge intensive sectors.

The rest of this paper is structured as follows. In Section 2, we provide antecedents of the study and they theoretical background along with research hypotheses. Section 3 presents the research design, data sources, measurement of the variables and analysis procedures. In Section 4 we present and discuss the empirical results of the study. Finally, Section 5 concludes the paper with a brief description of the main results and discussions on theoretical contributions, managerial implications, research limitations, and research avenues.

2. Literature Review

2.1 Theoretical foundation

The study is underpinned by the Resource-Based View (RBV) of the firm, Knowledge-Based View (KBV), and Dynamic Capabilities perspective to elucidate this process by which firms can build and sustain a competitive advantage over time based on their intangible resources. According to RBV, competitive superiority is based on the possession of valuable, rare, inimitable and non-substitutable resources (Barney, 1991). In modern economies these strategic resources are more frequently tangible but not always, as opposed to physical. KBV transcends RBV by highlighting the organization knowledge as the most important strategic resource (Grant, 1996). Intellectual Capital Intellectual capital is the formalized or codified knowledge entrenched in human resources, organization structure and processes which creates for value. Dynamic capabilities theory also provides insight into how companies combine, recombine and refresh intellectual capital to react to technological change and competitive stress in knowledge-intensive industries, including banking (Teece, 2007; Teece, 2018).

2.2 Intellectual capital and sustained competitive advantages

Intellectual capital has been increasingly recognized as a main contributor to long-term competitive advantage. It allows companies to remain in a "virtuous circle" where they create value continually and adapt to the changing environment better than competitors. In contrast, banking industry needs intellectual capital to underpin quality of service, risk management, regulatory capacity and digital innovation that are necessary resources for its survival in a competitive environment. Recent empirical evidence also reveal that those companies with higher IC efficiency are more likely to enjoy persistent abnormal profitability, i.e., sustained competitive advantage rather than transient success (Nadeem et al., 2023; Smriti & Das, 2024). Intellectual value, unlike physical property, is not possible to duplicate so quickly, therefore it results in a very durable competitive advantage. Thus, it is expected that intellectual capital has a direct and positive effect on the long-term competitive advantage.

H1: Intellectual value and the long-term competitive advantage are positively related.

2.3 Intellectual capital and innovation ability

Innovation capability is the capacity of a firm to create and exploit new products, services, or processes in reaction to market and technological variation. The building blocks of innovation Intellectual capital is critical for the levels and types of innovation, for enabling learning, knowledge sharing and creative problem solving within organisations. Human capital brings skills and know how; structural capital allows for the deepening of knowledge as well as process improvement; relational capital supports the external acquisition of knowledge. Intellectual capital has been recently recognized as a key determinant of innovation capability, particularly in industries undergoing digital transformation (Audretsch et al., 2023; Huang et al., 2023). In the banking sector, innovation capability is manifested through digital banking services, integrating fintech and process automation. Larger intellectual capital would allow banks to be more active in innovating and able to react towards competitive and regulatory challenges.

Hypothesis 2: The intellectual capital is positively associated with innovation capability.

2.4 Innovation ability for long-term competitive advantage

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Innovation is inherent in all disciplines representing the ability to transfer strategic resources into competive advantages. Companies unfazed by the constant waves of innovation can differentiate their services more effectively, optimize operations and respond to evolving customer expectations. hence firms will maintain their performance advantage over time. Empirical evidence from current research suggests that the capability to innovate represents a key factor in long-term competitive edge, as it fosters the organisation's adaptability and resilience towards changing markets (Heredia et al., 2023; Xu et al., 2023). Within the banking industry, ceaseless innovation throughout products and broking can help firms / institutions drive customer loyalty, control operating overheads and compete pressure from fintech companies. Therefore, it is anticipated that innovation capability will have a positive influence on long-term competitive advantage.

Hypothesis 3: Innovation capability positively affects long-term competitive advantage.

2.5 The intermediating effect of innovation capability

Intellectual capital is a strategic asset But it doesn't automatically produce longterm competitive advantage. Under RBV and dynamic capabilities theory, resources need to be turned into organization's capabilities effectively if they are to deliver sustainable advantages. One such mechanism is innovation capability as a critical way to transform intellectual capital into long-term competitive effects. Empirical evidence available in latest literature also suggests that intellectual capital indirectly fosters the competitive advantage through innovation-specific capabilities (Nadeem et al., 2023; Smriti & Das, 2024). Cognitive capital as firm intellectual capital and innovation ability and bank's abnormal return In context of banking, intellectual capital reinforces the capacity for innovation as well which increases the banks potential to maintain competitive advantage and also being profitable above normal. Therefore, it is expected that innovation capability will mediate the relationship between intellectual capital and long-term competitive advantage.

Hypothesis 4: The relationship between intellectual capital and long-term competitive advantage is mediated by innovation capability.

2.6 Research model framework

Building on the rationale and hypotheses development, in the present study a research model is suggested wherein IC has an impact on long- term competitive advantage through two direct and indirect pathways mediated by innovation capability as a singl mediator. Innovation capability is the dynamic process that converts intellectual capital into sustainable competitive performance. As control variables, we add firm size, leverage, growth and firms' age to capture structural and financial differences between banks. The model is empirically tested by SmartPLS 4 on panel data of Indonesian listed banks in the period of 2023–2025.

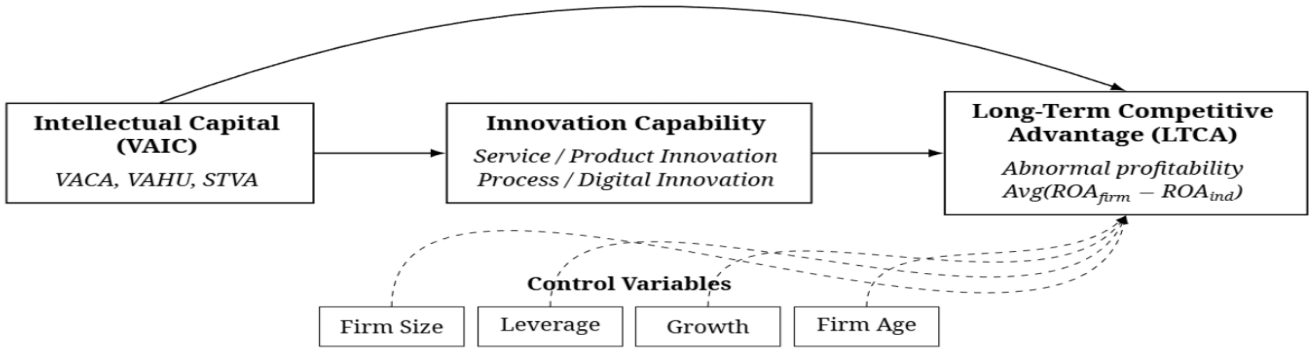

Figure 1. Intellectual Capital and Long-Term Competitive Advantage

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3. Methods Innovation

3.1 Design research

In this study, a quantitative explanatory research is used, because it tests the causality relationships among intellectual capital and innovation performance and long term competitive advantage. Built on the Resource-Based View and dynamic capabilities theory (Barney, 1991; Teece, 2018), the model is intended to describe how intangible resources give rise to competitive advantages that are endowed with sustainability. To account for such within-firm and time-varying establishment heterogeneity, we use a panel data framework. Recent research has highlighted in high-impact journals that explanatory designs with panel data gives more robust insights into the strategic resource–performance relationships in knowledge-based industries (Nadeem et al., 2023; Smriti & Das, 2024, Xu et al., 2023). Such model is especially appropriate for banking sectors in the process of fast digital transformation and innovation based competition.

3.2 Research data population

The population in this research is all banking companies that are listed on Indonesia Stock Exchange (IDX) within 2023-2025. The banking industry is chosen as it is an information intensive domain, highly reliant on the intellectual capital and with significant exposure to digital innovation. Purposive sampling method used to select companies that have complete annual and financial reports so we can carry out VAIC, innovation capability, and competitive advantage assessment. It is advantageous that panel data of listed banks can provide a better measure sustained competitive advantage over time. Previous research in high-impact journals confirms the use of banking-sector panel data to test models based on intellectual capital and innovation in emerging countries (Boubaker et al., 2024; Nadeem et al., 2023; Heredia et al., 2023). Information on the firms in detail is provided in Appendix A.

3.3 Measurement and data instruments

This research uses only secondary data from audited annual reports and financial statements. Intellectual capital is measured based on the VAIC model which has been broadly accepted and appraised in intellectual capital literature (Pulic, 2000; Nadeem et al., 2023). Innovation capability is measured by proxies of four types of innovation (service, product, process and digital) in line with the current state-of-the art research on innovation in financial services (Audretsch et al., 2023; Huang et al., 2023). Sustainable competitive advantage is referred to abnormal profitability in the long-run by industry-adjusted ROA. Control variables are firm size, leverage, growth and age. Full variable definitions and formulas are available in Appendix B.

3.4 Data analysis

These hypotheses are examined with Partial Least Square Structural Equation Modelling (PLS-SEM) through SmartPLS 4 that is appropriate in a study complex in nature, which involves mediation and formative constructs. PLS-SEM has the capability to estimate measurement and structural model simultaneously by considering non-normal data or small sample size. Path significance and mediation effects are assessed using bootstrapping with 5,000 subsamples. Latest top-tier research has emphasized SmartPLS as a suitable measurement tool for investigating intellectual capital–innovation–performance in banking and knowledge-intensive sectors (Nadeem et al., 2023; Smriti & Das, 2024; Heredia et al., 2023). Before hypotheses are tested, measurement reliability, validity, and multicollinearity diagnostics are performed.

4. Results of Innovation and Discussion

4.1 *Measurement model assessment*

All the constructs are normalized (Mean ≈ 0; SD ≈ 1), thus ensuring equivalence among variables in the PLS estimation. LTCA demonstrates a broad empirical distribution (–2.653 to 2.681) exhibiting mild skewness (0.145) and close-to-normal kurtosis (0.113), confirming acceptable dispersion in competitive advantage realisation. The average innovation capability ranges from –2.596 to 2.801, and it is distributed almost symmetrically (skewness –0.054). VACA, VAHU, and VAIC have positive skewness (0.793–1.144), indicating heterogeneity in value creation efficiency among banks. In general,

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the distributions are suitable for subsequent measurements and structure fitting without obvious scaling limitations.

Collinearity diagnositics for STVA, VACA and VAHU in the formative specification of VAIC are 1.000 each indicating VIF values far below than conservative (e.g., 3.3 or 5.0). This implies that there are no multicollinearity issues in the formative block, and it indicates reliable estimation of formative weights. Thus, the higher-order VAIC construct is not spurious due to overestimated standard errors caused by collinear formative components and can provide more trustful inferences on intellectual capital efficiency effect in the following structural model.

All the formative elements significantly contribute to the second-order VAIC construct. Greatest contribution is also found in the cases of VAHU (O = 0.956, t = 121.910, p < 0.001) and STVA (O = 0.942, t = 130.221, p < 0.001), suggesting that human capital efficiency and structural capital efficiency influence most the constitution of intellectual capital in this sample data set. VACA also have a positive effect and is significant (O = 0.404, t = 4.987, p <0.001) with lesser strength when compared to the other two countries. The low CI values of the STVA and VAHU also suggest that the estimates are very stable, which endorses formative measure of VAIC in hypothesis testing.

Table 4 presents the measurement properties of reflective constructs in the model. Since Innovation Capability, LTCA and all controls are operationalized as single-item reflective constructs, internal consistency reliability (Cronbach's alpha, composite reliability) and convergent validity (AVE) do not apply and thus are not reported. In SmartPLS, loadings of single-items are by definition fixed at 1.000, and the constructs were assumed to be directly observable proxies for the latent variable. In other words, measurement model validation is performed mainly in formative VAIC (collinearity and weights in Tables 2–3), and the single-item reflective constructs of Table 4 are considered as indicators for running the structural model.

Table 1 Descriptive Statistics of Research Variables

Variable	Mean	Median	Min	Max	SD	Skewness	Kurtosis
AGE	0.000	0.014	-1.886	1.915	1.000	0.158	-0.91
GROWTH	0.000	0	-3.128	3.156	1.000	0.435	1.268
Innovation_Capability	0.000	-0.05	-2.596	2.801	1.000	-0.054	-0.133
LEV	0.000	0.095	-2.531	1.895	1.000	-0.513	-0.288
LTCA	0.000	-0.009	-2.653	2.681	1.000	0.145	0.113
SIZE	0.000	0.016	-2.729	1.856	1.000	-0.469	-0.303
STVA	0.000	-0.218	-1.971	2.41	1.000	0.445	-0.361
VACA	0.000	-0.165	-2.105	2.854	1.000	0.793	0.405
VAHU	0.000	-0.33	-1.456	3.111	1.000	1.144	0.881
VAIC	0.000	-0.153	-1.449	3.237	1.000	1.044	0.74

Table 2 Collinearity Assessment of Formative Indicators (VIF Values for VAIC)

(Higher-Order VAIC)	VIF
STVA	1.000
VACA	1.000
VAHU	1.000

Table 3 Outer Weights and Significance of Formative Indicators (VAIC)

Formative Link	Weight (O)	STDEV	t-value	p-value	95% CI
VAIC → STVA	0.942	0.007	130.221	0.000	[0.927, 0.955]
VAIC → VACA	0.404	0.081	4.987	0.000	[0.229, 0.550]
VAIC → VAHU	0.956	0.008	121.91	0.000	[0.939, 0.969]

Table 4 Reliability and Validity Assessment of Reflective Constructs

Construct	Measurement Type	Indicators	Cronbach's Alpha	Composite Reliability	AVE	Note
Innovation_Capability	Single-item (Reflective)	1	n/a	n/a	n/a	Single-item
LTCA	Single-item (Reflective)	1	n/a	n/a	n/a	Single-item

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Construct	Measurement Type	Indicators	Cronbach's Alpha	Composite Reliability	AVE	Note
SIZE	Single-item (Reflective)	1	n/a	n/a	n/a	Control
LEV	Single-item (Reflective)	1	n/a	n/a	n/a	Control
GROWTH	Single-item (Reflective)	1	n/a	n/a	n/a	Control
AGE	Single-item (Reflective)	1	n/a	n/a	n/a	Control

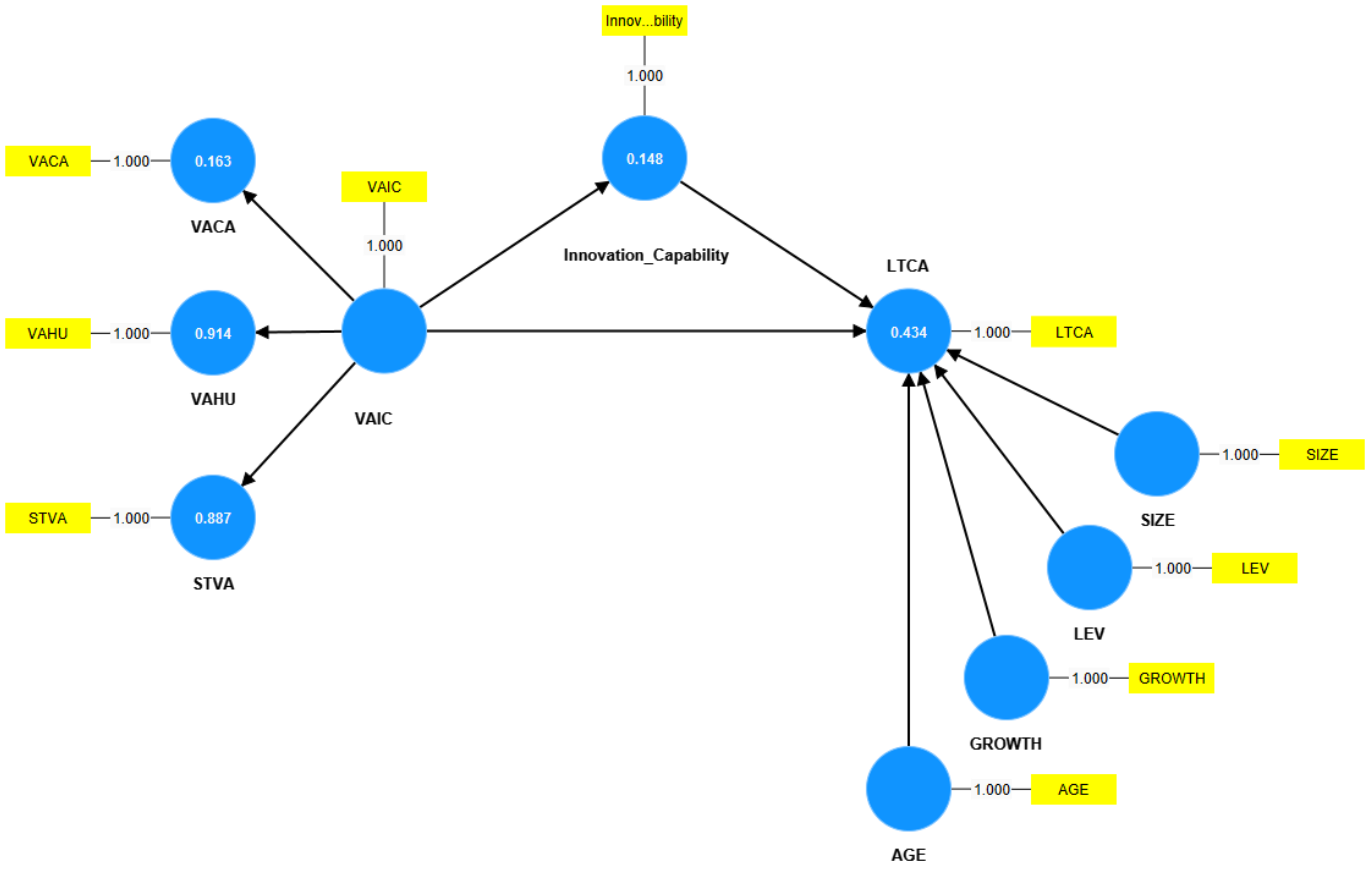

Figure 2 Outer (Measurement)

4.2 *Structural model assessment* (Inner Model)

As shown in Table 5, VAIC has a positive and non-significant direct impact on LTCA (β = 0.161; p = 0.077), thereby rejecting H1 at the 95% confidence level. On the other hand, VAIC positively influences innovation capability (β = 0.384; p < 0.001), thus accepting H2. Innovativeness positively mediates LTCA (β = 0.537; p < 0.00), which means that H3 is supported. The indirect effect of VAIC on LTCA through innovation capability is significant and positive (β =0.206; p < 0.001), thus supporting H4 (partial mediation). None of the control variables are significant except for a negative leverage association with LTCA; firm age, growth and size aren't signiffcant.

Table 5 Path Coefficients and Hypotheses Testing Results

Hypothesis	Structural Path	Path Coefficient (β)	STDEV	t-value	p-value	Decision
H1	VAIC → LTCA	0.161	0.091	1.769	0.077	Not supported
H2	VAIC → Innovation_Capability	0.384	0.072	5.34	0.000	Supported

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Hypothesis	Structural Path	Path Coefficient (β)	STDEV	t-value	p-value	Decision
H3	Innovation_Capability → LTCA	0.537	0.083	6.436	0.000	Supported
H4	VAIC → Innovation_Capability → LTCA	0.206	0.053	3.864	0.000	Supported
C1	AGE → LTCA	−0.029	0.067	0.435	0.664	Not significant
C2	GROWTH → LTCA	0.069	0.08	0.866	0.386	Not significant
C3	LEV → LTCA	−0.195	0.073	2.668	0.008	Significant
C4	SIZE → LTCA	−0.065	0.068	0.956	0.339	Not significant

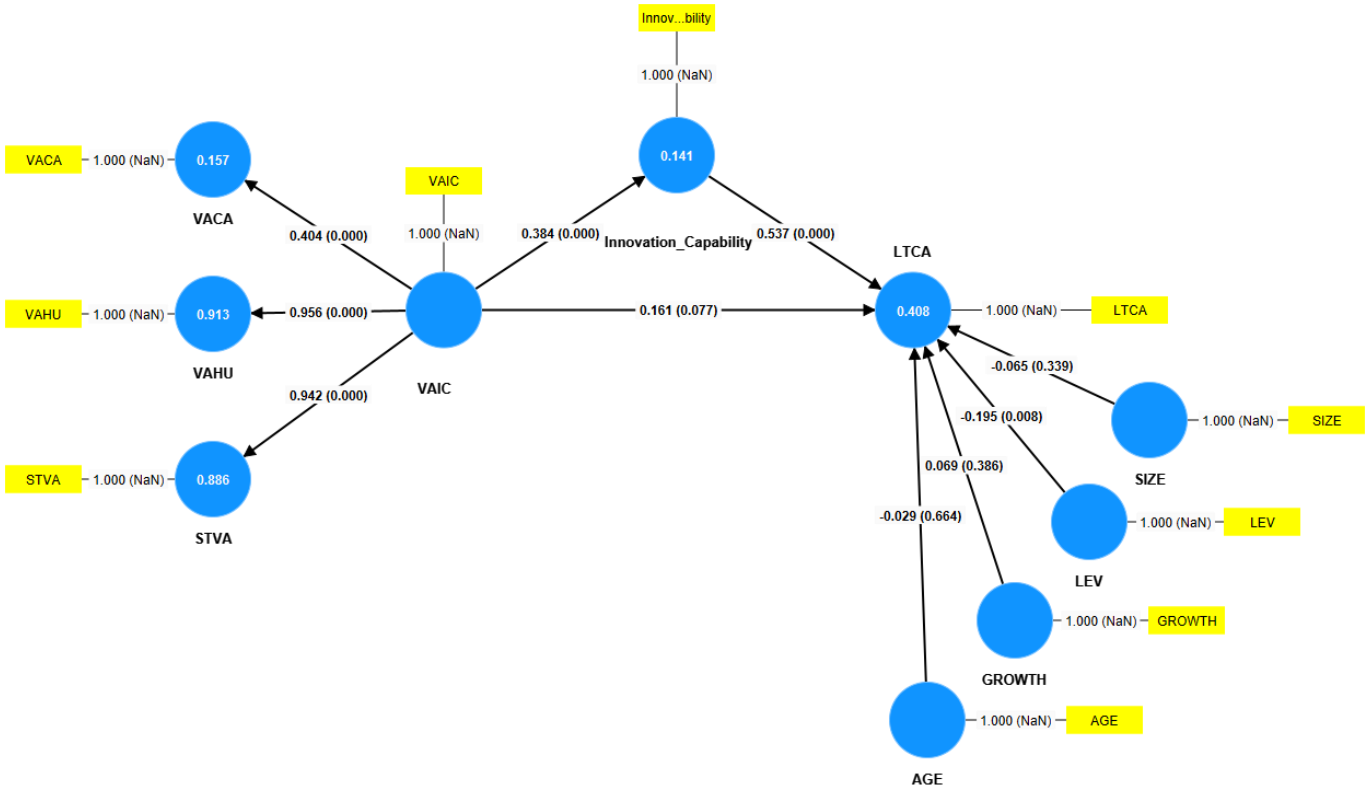

Figure 3 Inner (Structural)

4.3 Coefficient of determination and effect size

The explained variance of the model for innovation capability is 14.8% (R^2 = 0.148) with low explanatory power, in which VAIC is the main variable that contributes to this relation (f^2 = 0.173, medium effect), as Table 6 demonstrates. In case of LTCA, the model explains 43.4% variation (R^2 = 0.434; adjusted R^2 = 0.408), indicating a high explanatory power in a competitive banking environment. The most important factor SSTC is capability to innovate ability (f^2 =.403, big effect), differing from the direct impact VAIC (f^2 = 0.033). Control variables show no to small effects and leverage has a small, but meaningful effect (f^2 = 0.062). In sum, Table 6 validates that innovation capability is the major determiner of explained variance in LTCA.

4.4 Predictive relevance of the model

The blinded Q^2values (Stone–Geisser) are presented in Table 7. The two internal concepts have Q^2 greater than 0 and then it can be estimated the model is predictive. The variable innovation capacity is characterized by a Q^2 of 0.125 (thus, predictive relevance is moderate), while LTCA features a substantially higher value for the coefficient (Q^2=0.402) and demonstrates that the model has good predictive relevance. These findings indicates that the model not only explains variance (as indicated in Table 6), it contains predictive content relative to long-term competitive success, at least.

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The results in Table 7 are consistent with the robustness and substantive extension of our structural model to explain and predict competitive performance outcomes for banking that we claimed.

4.5 Mediation effect analysis

Table 8 shows that the indirect effect of intellectual capital (VAIC) on long-term competitive advantage (LTCA) via innovation capability is positive and significant at, $\beta = 0.206$; $p < .001$. The confidence interval for mediation effect excluded zero, indicating robustness of the mediation effect. The findings suggest a partial mediation, as the direct effect of VAIC to LTCA is positive but less intense and marginally significant (see Table 5). This indicates that IC enhances the long-term competitive advantage of a firm more by improving the innovation capability of firms rather than going through only direct route.

4.6 Robustness check with control variables

Table 9 reports that actually the majority of controls are found to be statistically insignificant determinants of LTCA. Company age, growth and size exhibit faint insignificant associations, suggesting that structural properties alone cannot account for prolonged competitive advantage in the cases of study banks. On the contrary, LTCA is negatively affected by leverage ($\beta = -0.195$; $p < 0.01$), implying that financial risk affects adversely the capacities of banks to sustain abnormal profitability in the long run. The addition of these controls to the models makes no qualitative difference in terms of both significance and direction for our main structural paths (cfr. Tables 5 and 8), hence stabilizing the robustness of our key findings.

Table 6. Coefficient of Determination (R^2) and Effect Size (f^2)

Endogenous Construct	R^2	R^2 Adjusted	Explanatory Path	f^2	Effect Size
Innovation_Capability	0.148	0.141	VAIC → Innovation_Capability	0.173	Medium
LTCA	0.434	0.408	Innovation_Capability → LTCA	0.403	Large
			VAIC → LTCA	0.033	Small
			AGE → LTCA	0.001	Negligible
			GROWTH → LTCA	0.008	Negligible
			LEV → LTCA	0.062	Small
			SIZE → LTCA	0.006	Negligible

Table 7. Predictive Relevance (Q^2) of Endogenous Constructs

Endogenous Construct	SSO	SSE	Q^2 (= 1 – SSE/SSO)	Predictive Relevance
Innovation_Capability	135	118.129	0.125	Medium
LTCA	135	80.795	0.402	High

Table 8 Specific Indirect Effects and Mediation Test Results

Mediation Path	(β)	STDEV	t-value	p-value	95% CI	Mediation Type
VAIC → Innovation_Capability → LTCA	0.206	0.053	3.864	0.000	[0.108, 0.315]	Partial mediation

Table 9 Effects of Control Variables on Long-Term Competitive Advantage

Control Variable	Path Coefficient (β)	STDEV	t-value	p-value	Effect
AGE → LTCA	−0.029	0.067	0.435	0.664	Not significant
GROWTH → LTCA	0.069	0.08	0.866	0.386	Not significant
LEV → LTCA	−0.195	0.073	2.668	0.008	Significant (negative)
SIZE → LTCA	−0.065	0.068	0.956	0.339	Not significant

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4.7

Discussion of key findings

The manner in which sustainable competitive advantage is generated over time within the banking industry by intellectual capital can be understood with the help of this study, with the capability of innovation being central to the process of transformation. The contention that intangibles cannot contribute to sustained competitive advantage without being effectively transformed into organisational abilities which facilitate adaptation and rejuvenation is supported by empirical evidence provided by the Resource-Based View (RBV), Knowledge-Based View (KBV) and Dynamic Capabilities Theory.

Firstly, they demonstrate that intellectual capital alone does not lead to sustained competitive advantage. This finding is consistent with the fundamental tenets of dynamic capabilities theory, which asserts that resources must constantly be reconfigured in order to adapt to environmental changes (Teece, 2018). In tightly regulated, technology-intensive industries such as banking, however, simply possessing human, structural, and relational capital may not generate long-term benefits if these resources are not mobilised to transform innovation. It is only possible to generate value from intellectual capital by strategically utilising it through learning, development and innovation processes, according to recent research in top-ranked journals (Nadeem et al., 2023; Smriti & Das, 2024).

Secondly, the significant effect of innovation capability emphasises its role as a dynamic capability in linking intellectual capital and long-run competitive performance. In line with the Knowledge-Based View, organizational knowledge rooted in individual routines and systems has economic worth when it creates opportunities for innovation (Grant, 1996). Appropriate empirical evidence in current days support this view in that organizations with higher efficiency of intellectual capital are better positioned to create digital offerings, make process improvements and address disruptive technologies (Audretsch et al., 2023; Huang et al., 2023). In the context of banking, innovation capability is reflected in digitised banking channels, partnerships with fintech players, use of analytics and automation to improve customer experience and operational resilience.

Third, the mediating effect of innovation capability is one of the most important theoretical contributions and novelty emphasis in this study. Previous studies frequently focused on the direct association between intellectual capital and performance, research has relatively under-studied how intellectual capital creates sustained competitive advantage through innovation capability, especially in emerging market. By demonstrating the empirical support for this mediating mechanism, the study contributes to existing literature and addresses calls for a more processive understanding of how intangible resources generate sustained value (Heredia et al., 2023; Xu et al., 2023). This contribution is particularly important in the context of a global financial market that becomes more complex and dynamic.

From an international view, there are significant implications of the findings. Amid digital transformation and regulatory recalibration in banking around the globe under competition from fintech, intellectual capital needs to be strategically managed for ongoing innovations. The findings provide evidence that banks in either developed or emerging economies may be interest in investing further than talent and knowledge systems, but also on the organizational design and culture which favours the experimentation, learning and innovation as source of long-term competitive advantage. This observation is in line with recent international evidence that highlights that innovation capability plays a role as predictor of resilience and sustainability in the FI (Boubaker et al., 2024; Tiscini et al., 2022).

From the perspective of Indonesian banking sector, this study has a practical significance. Traditional competition strategies are limited and sometimes ha possible restrictions in the context of emerging economies, where resources availability and institutional challenges mostly occur. These

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results also demonstrate innovation capability as a means for banks to transform intellectual capital to a sustainable competitive advantage despite these challenges. This finds support for this strategic value of intangibles in emerging markets, where competitive advantage is now based on knowledge-intensive and innovation-focused strategies rather than pure scale or physical assets.

Finally, it creates methodological value by using a PLS-SEM model that includes formative and reflective constructs in order to capture the complexity of intellectual capital and competitive advantage. This is consistent with a recent trend in management and innovation research, and it strengthens the validity of the results. In conclusion, the present study extends theoretical implications and effective practice by proving innovation capability is the primary bridge for IC to create long term competitive advantage. By promoting capability transformation rather than resource possession, the findings contribute to and extend RBV as well as dynamic capabilities literature with actionable implications for banks during digital transition amidst competitive chaos.

5. Conclusion

From this study, it can be inferred that intellectual capital is having a strategic role in improving long-term competitive advantage within the banking industry by way of developing innovation capability. Based on the Resource-Based View, Knowledge- Based View and Dynamic Capabilities Theory we showed evidence that intangible knowledge-based resources by itself cannot provide a sustained competitive advantage unless they get transformed into organisational capabilities for continuous innovation. Maintaining the "innovation capability" is thus found to be the chief enabler for banks to make use of intellectual capital in the light of technology change, competition and changing consumer behaviour. The findings highlight the necessity of human capabilities, organizational systems, and knowledge structures investment for developing an innovation-based culture and activities. On a practical level, the study implies that banks intending to have longevity should emphasize on pursuit of capability building agenda rather than focusing only on amassing resources. Through empirical confirmation of the mediating effect of innovation capability in an emerging market setting, these results make theoretical contributions to intellectual capital and strategic management literature while providing practical implications for policymakers and banking practitioners who seek enhanced long-term competitive advantages in the increasingly dynamic and digitalized financial markets.

CRediT Author Statement

Sugianto: Conceptualization; Methodology; Formal analysis; Data curation; Writing original draft; Writing review & editing; Visualization.

Declaration of Competing Interest

The author states that there is no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data Availability Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. Supplementary datasets produced and analyzed during the current study are also uploaded on an open access repository for maintaining transparency and reproducibility.

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Appendix/Appendices

Appendix Data A. Sample Description and Data Structure

Dimension	Category	Description
Population and Scope	Population	All commercial banks listed on the Indonesia Stock Exchange
	Industry	Banking and financial services
	Listing status	Publicly listed banks
Time Structure	Observation period	2023–2025
	Data frequency	Annual
Sample Size	Number of banks	45
	Total firm-year observations	135
Panel Characteristics	Data structure	Balanced panel
	Data completeness	No missing values
Ownership Structure	Type 1	State-owned banks (BUMN): 9 banks
	Type 2	Private national banks: 16 banks
	Type 3	Foreign exchange banks: 11 banks
	Type 4	Joint-venture banks: 7 banks
	Type 5	Foreign banks: 2 banks
Variables – Core Constructs	Intellectual Capital	VAIC, VACA, VAHU, STVA
	Innovation Capability	Innovation_Capability (composite innovation index)
	Competitive Advantage	LTCA (abnormal profitability relative to industry)
Control Variables	Firm characteristics	SIZE, LEV, GROWTH, AGE
Data Sources	Financial inputs	Total assets, liabilities, equity, revenue
	Data origin	Audited annual financial statements

Appendix data B. Instrument of Research Variables

No	Variable	Code	Formula	Description	Source
1	Value Added	VA	VA = OP + HC + D + A	Total value created by the firm from operating activities; OP = operating profit, HC = personnel expense, D = depreciation, A = amortization	(Pulic, 2004; Shah et al., 2024)
2	Capital Employed	CE	Total Equity	Financial capital employed to generate value	Pulic (2000); Nadeem et al. (2023), Journal of Intellectual Capital
3	Human Capital	HC	Total personnel expense	Investment in employees' knowledge, skills, and expertise	Pulic (2000); Smriti & Das (2024), Journal of Intellectual Capital
4	Structural Capital	SC	SC = VA – HC	Organizational processes, systems, and routines supporting value creation	Pulic (2000); Xu et al. (2023), Technological Forecasting & Social Change
5	Capital Employed Efficiency	VACA	VA / CE	Efficiency of physical and financial capital in generating value	Pulic (2000); Nadeem et al. (2023), Journal of Intellectual Capital
6	Human Capital Efficiency	VAHU	VA / HC	Efficiency of human capital in creating firm value	Pulic (2000); Smriti & Das (2024), Journal of Intellectual Capital
7	Structural Capital Efficiency	STVA	SC / VA	Contribution of structural capital to value creation	Pulic (2000); Xu et al. (2023), Technological Forecasting & Social Change
8	Intellectual Capital	IC (VAIC)	VAIC = VACA + VAHU + STVA	Overall efficiency of intellectual capital utilization	Pulic (2000); Nadeem et al. (2023), Journal of Intellectual Capital
9	Innovation Capability	INNOV	Innovation index / proxy	Firm's ability to develop service, product, process, and digital innovations	Audretsch et al. (2023), Strategic Management Journal

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No	Variable	Code	Formula	Description	Source
10	Long-Term Competitive Advantage	LTCA	Avg(ROA_firm − ROA_industry)	Persistent abnormal profitability as a proxy for sustained competitive advantage	Peteraf & Barney (2003); Heredia et al. (2023), Strategic Management Journal
11	Firm Size	SIZE	ln(Total Assets)	Controls for scale and resource endowment effects	Boubaker et al. (2024), Journal of Banking & Finance
12	Leverage	LEV	Total Liabilities / Total Assets	Controls for financial risk and capital structure	Hanaysha & Al-Shaikh (2022), International Journal of Finance
13	Firm Growth	GROWTH	(Revenue_t − Revenue_t−1) / Revenue_t−1	Controls for business expansion dynamics	Xu et al. (2023), Technological Forecasting & Social Change
14	Firm Age	AGE	Years since establishment	Controls for organizational maturity and experience	Smriti & Das (2024), Journal of Intellectual Capital

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