

Enhancing the Competitive Advantage and Perceived Financial Performance of SMEs: A Quadruple Helix Model Approach

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ABSTRACT

Purpose – The growth of SMEs still requires support from various parties, including the implementation of policies, to ensure they make a significant contribution to economic development. The current problem is the weak ability of human resources, particularly in creativity and innovation, which negatively affects competitive advantage and business performance. The focus of this research is to identify factors that can improve the competitiveness and performance of SMEs from the perspective of the quadruple helix model.

Design/methodology/approach – The population of this study is SMEs in Bali, with a total of 122,941 spread across 9 districts. The sampling technique used is stratified random sampling, with a sample of 399 SMEs. The analysis technique used is SEM PLS with SmartPLS.

Finding/Results – Based on the analysis, three pillars of the quadruple helix-intellectuals, government, and the business sector show a positive and statistically significant association with the perceived financial performance of SMEs. In contrast, the civil society pillar does not exhibit a direct association with the perceived financial performance of SMEs. Furthermore, competitive advantage was found to be closely linked to improved financial outcomes for SMEs.

Conclusion – The three pillars of the quadruple helix—intellectuals, government, and the business sector—demonstrate a positive and statistically significant association with improved perceived financial performance among SMEs, with the business sector component showing the strongest association. Meanwhile, competitive advantage is a crucial mediator; external support does not automatically yield benefits unless SMEs can transform it into an independent competitive advantage, such as product uniqueness or cost efficiency.

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1. Introduction

Small and medium enterprises (SMEs) have an important role as the main foundation and driver of the national economy in various developing countries, including Indonesia. SMEs play an important role in absorbing labor and contributing to gross domestic product, so that SMEs are able to function as economic drivers of the community (Hakimah *et al.*, 2019). Despite their strategic role, SMEs constantly face challenges related to financial stability and low business sustainability (Kusumastuti & Aligarh, 2024). In the current era of market disruption and global economic uncertainty, the financial performance of SMEs cannot rely solely on limited internal capital (Adiandari, 2022). The financial sustainability of SMEs is highly dependent on how business actors integrate themselves and collaborate with various dynamic parties (Ibrahim *et al.*, 2021). In this context, a quadruple helix framework that synergises the roles of intellectuals, government, business, and civil society can serve as an ideal configuration to encourage the collective strengthening of SMEs' capacities (Cai & Lattu, 2022). However, the reality shows a gap in the collaborative implementation of each component of the quadruple helix (Park & Stek, 2022). On the one hand, the government has launched various alternative policies, ranging from interest subsidies to regulatory ease. Academics continue to conduct applied research related to SMEs, businesses continue to strive to open supply chain partnerships, and civil society provides moral support (Yun & Liu, 2019). On the other hand, the majority of SMEs still experience stagnant income and fail in their efforts to upgrade. External assistance from various parties is often transactional and not on target, so the involvement of the four pillars of the quadruple helix fails to realize improvements in financial performance indicators, such as profitability and growth of SME assets (Christian & Widyaningrum, 2025).

Previous studies show inconsistencies in findings regarding the effectiveness and impact of quadruple helix elements on financial performance. Research by Dhewanto *et al.* (2021), Ma *et al.* (2024), and Harminingsih *et al.* (2022) proves that regulatory support, government policies, and knowledge transfer from academics are able to improve financial performance. On the contrary, the research of Basir *et al.* (2026), Lazarov & Semenescu (2022), and Shahabuddin (2025) actually found that government policy interventions that are bureaucratic, rigid, and require the content of political interests often hinder innovation and burden the operations of SMEs, so they can actually reduce the profits of SMEs. Meanwhile, mentoring programs from academics are sometimes too theoretical and not in line with the dynamics of real market needs (Maziriri *et al.* 2021). Even the intervention of local communities that are part of civil society sometimes triggers the formation of comfort zones that can actually weaken the financial independence of business actors (Ahman *et al.*, 2020). The gap in the results of previous studies indicates that the direct influence of the quadruple helix pillars on financial performance is unstable and contextual. This finding is the basis for the researcher to study more in-depth by including the intervening competitive advantage variable, which acts as a mechanism to link the quadruple helix elements to financial performance.

Conceptually, this study is designed to fill the theoretical gap in the strategic management literature, especially by bridging the limitations of the resource-based view (RBV) approach and the quadruple helix. Conventional RBV theory argues that superior and sustainable financial performance comes from owning and controlling a company's internal assets that are valuable, rare, difficult to replicate, and well-organized (Helfat *et al.* 2023). However, the RBV theory is often unable to explain empirical realities in SMEs. Structurally, SMEs are entities that have limited resources, both in terms of capital, technology, and human resources (Islamic

et al., 2021). Researchers have rarely integrated the concept of a quadruple helix, which focuses on external relational capacity, with the concept of a quadruple helix that focuses on external relational capacity with an approach that focuses on internal capacity into a single intact conceptual model. This research was carried out by positioning the quadruple helix element as a provider of valuable external resources, but these external resources are latent and have no financial impact unless they are internalized and transformed into the organization's internal capabilities.

The novelty of this study lies in adding competitive advantage variables as mediators that bridge the influence of each quadruple helix element on SME performance. This research offers a new theoretical perspective that confirms that relational capital, knowledge transfer, regulation, and social capital from the quadruple helix ecosystem cannot directly improve SMEs' financial performance. Each component of the quadruple helix transfers a unique form of external relational resources, which demands different internal RBV mechanisms to be converted into a sustained competitive advantage. Competitive advantage is manifested in product differentiation strategies and high selling value, operational cost efficiency, and speed and flexibility in responding to market change dynamics. When competitive advantage is well formed, financial performance will improve.

2. Literature Review & Hypothesis Development

2.1 Resource Based View (RBV)

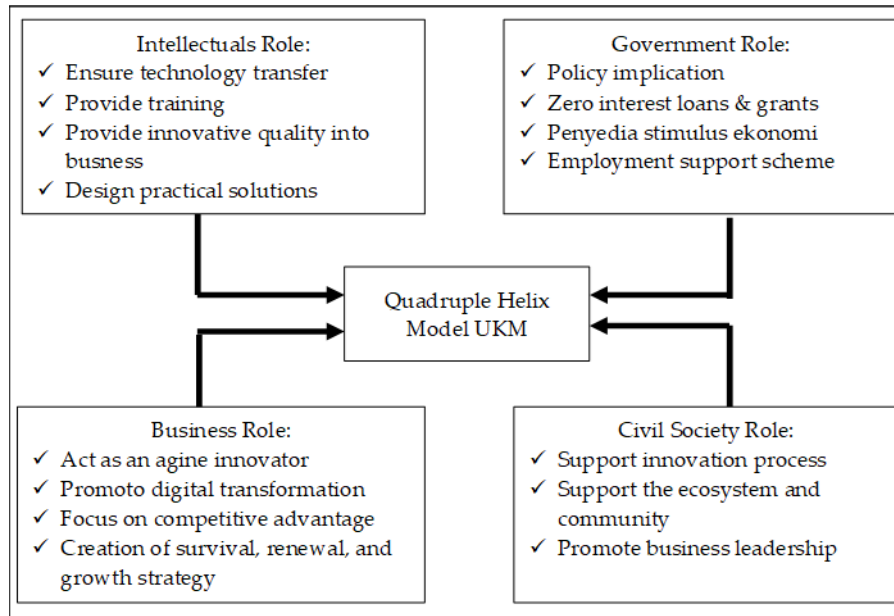
RBV states that a company's competitive advantage and superior financial performance are determined by the ownership of resources that are valuable, scarce, difficult to replicate, and irreplaceable (Helfat et al., 2023). In the context of SMEs, conventional RBV theory often faces challenges due to the limitations of internal physical and financial assets inherent in small-scale businesses.

Therefore, this study expands the scope of traditional RBV to relational RBV. This approach argues that valuable resources are not only within the company's internal boundaries but can be accessed through a network of strategic external relationships. Through this perspective, interaction with external parties is not just social assistance but the process of acquiring intangible assets such as technical knowledge, regulatory legitimacy, and social capital to form competitive advantage.

2.2 Quadruple Helix Framework

The application of the quadruple helix framework in the SME sector aims to help improve the SME class through innovation, digitalization, and market expansion (Parveen et al., 2015). The quadruple helix pillar includes intellectuals, government, business, and civil society. Each pillar has its role and contribution in strengthening the competitiveness of SMEs. Figure 1 below illustrates the quadruple helix framework.

Figure 1. Quadruple Helix Model



To bridge the external properties of the quadruple helix framework and the internal properties of the RBV, this study describes the systematic theoretical conversion mechanism. SMEs have limited resources, so rational interaction with the pillars of the quadruple helix serves as an entry point to external information, knowledge, and legitimacy. However, this external network does not automatically become a sustainable competitive advantage for SMEs if it is not converted into internal assets that meet the VRIO criteria. This conversion process is possible through the absorptive capacity of SMEs, which consists of four stages, namely acquisition, assimilation, transformation, and exploitation (Carayannis et al. 2022). Through this process, external relational capital is filtered and institutionalized into valuable, rare, inimitable, and organised organisational routines. Table 1 serves as a mechanism for converting each pillar of the quadruple helix into a VRIO capability.

Table 1. Conversion of each quadruple helix pillar

Quadruple Helix Pillar	External Relational Resources	Conversion Mechanism (Absorbent Capacity & Internal Routine)	Results of VRIO SME Resource Conversion
Intellectuals	Scientific knowledge, technology, research results	Transfer of → internal training technology → codification into tacit knowledge of workers	VRIO tech capability: an innovative, scientifically certified product that is efficient and difficult to replicate without similar research
Business	Market information, tactical alliances, supply chain access	Business collaboration → , product adjustment, → local supply system integration	VRIO market capability: exclusive supply network and socially embedded market reputation
Government	Regulations, subsidies, official certification programs	Utilization of incentives to → standardize the legality → of formal governance adoption	VRIO Institutional asset: formal legitimacy (IPR/Halal/Export) that opens exclusive market access

Civil Society	Local wisdom, community support, social loyalty	Co-creation of products → internalizes local values → of community-based marketing	VRIO cultural capability: brand excellence based on local emotional attachment that cannot be replicated by foreigners.
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The intellectuals' pillar is an external relational resource in the form of access to research results, new technologies, technical training and scientific expertise. SMEs acquire this knowledge through community service programs or research collaborations. Through assimilation and transformation, complex scientific knowledge is translated into employees' practical skills or new product patents/formulations. Technical knowledge that has been modified according to the local context of SMEs becomes valuable (improving product efficiency/quality) and rare (not all competitors have the same access to research). This asset is inimitable because it is embedded in the tacit knowledge of SME employees and supported by the organization through new production SOPs

The business pillar is an external relational resource in the form of market information, consumer trends, supply chain efficiency, and marketing collaboration opportunities. Through regular interaction with other business actors, such as industry associations, SMEs can absorb management best practices and understand market dynamics. This information is transformed into an adaptive product positioning strategy (Carayannis et al. 2022). This market adaptation capability is valuable for responding quickly to changing trends. The uniqueness of the local business network makes it rare. The trust and reputation built in a business network are complex social assets, so they are inimitable by new competitors and exploitable through a flexible sales organizational structure.

The pillars of government are external relational resources in the form of incentive policies, capital/subsidy assistance, free certification, and formal legality. SMEs use this regulatory capital to strengthen their legal and operational legitimacy. Assistance from related agencies is transformed into more professional business governance. Formal legitimacy (such as certification) is very valuable for penetrating modern or export markets (Anwar & Shah, 2021). Having certain certifications at the local SME level is often still rare. Bureaucratic processes and a track record of good relations with policymakers make these relational assets inimitable and institutionalized through organizational legal compliance.

The civil society pillar is an external relational resource in the form of local social-environmental issues, direct consumer feedback, community-based loyalty, and local wisdom. SMEs integrate community values and consumer preferences into their brand identity. Local culture is assimilated into the process of creating product value (e.g. eco-friendly or culture-based products). This cultural and community attachment creates very high value in the eyes of local consumers (Anwar & Shah, 2021). This asset is very rare and inimitable because outside competitors or large companies do not have the same emotional and geographical proximity to the local community. SMEs organize it through a community-based marketing strategy.

2.3 Perceived Financial Performance

Perceived financial performance is conceptually an outcome in the form of profitability, sales growth, or return on investment, as felt by managers or SME owners. Perceived financial performance in SMEs is a subjective assessment made by business owners or managers regarding the condition and financial achievements of their business. This performance

assessment is carried out when formal financial statement data is not available or difficult to verify directly from SMEs (Farrington, 2017; Kozubíkova et al. 2023). The main indicators used in assessing perceived financial performance are sales growth, profit generation, capital growth, and cash ability (Kozubíkova et al. 2023).

Sales growth is seen as an increase in turnover or income over time according to the owner's view. Profit acquisition is viewed from the assumption that the business carried out is able to generate sufficient net profit for operations. Capital growth is assessed by whether assets or business capital have increased compared to the previous period. Meanwhile, cash ability is assessed based on the adequacy of daily cash flow to finance routine needs.

2.4 Hypothesis Development

Theoretically, SMEs' interaction with university academics, as pillars of intellectual life, enables SMEs to transfer technology and applied knowledge. Knowledge from research results conducted by universities can contribute to improving production efficiency, so it is expected to reduce operational expenses and increase SME profit margins (Ryan et al., 2023). The intellectual pillar is a driver of creativity, innovation, and technology for SMEs, so it can improve SMEs' ability to earn profits (Ma et al., 2024). Intellectual has made significant efforts to promote the evolution of the Triple Helix to address trade, industry and work culture issues (Noya et al., 2023). Universities play a significant role as providers of human resources and knowledge for critical socio-economic development. This is in line with the research of Siregar et al. (2025), which found that intellectual capital has a positive effect on financial performance.

H1: Intellectual capital has a positive effect on the perceived financial performance of SMEs.

The government's role as the owner of regulatory authority and the allocator of public resources has contributed to SMEs by providing assistance in the form of subsidies, tax incentives, and free exhibition facilities, which can reduce both capital and marketing costs, directly impacting the increase in SME profits. Synergy between the central and regional governments is needed to achieve the vision, mission, and goals of SME development. The government can mobilize the community to increase creativity, ideas and skills so that it is expected to be able to improve financial performance (Hakimah et al., 2019). The government needs to introduce innovative practices and procedures for entrepreneurial development to foster creativity and innovation within the community and supply chain, which is expected to improve the financial performance of SMEs (Ahman et al., 2020). Based on the above explanation, the research hypothesis is:

H2: Government has a positive effect on the perceived financial performance of SMEs

The role of the business pillar in the quadruple helix is a business-to-business relationship between large companies and SMEs by providing direct access to a stable supply chain and larger sales volumes. Industries that are ready to accommodate or buy SME products can ensure fast inventory turnover and can increase SME business income (Maziriri et al., 2021).

Based on the above explanation, this research hypothesizes that

H3: Business has a positive effect on the perceived financial performance of SMEs

The pillars of civil society, such as community organizations, associations, and local consumers, play a crucial role in creating social commerce. Loyalty support from the local community triggers repeat purchases and free promotions (Yun & Liu, 2019). This minimizes customer acquisition costs, increasing the efficiency of SMEs and enabling them to maximize profits. Close, mutually supportive relationships and the symbiosis of mutualism are expected to drive the growth of a sustainable creative industry (Cai & Lattu, 2022). Innovations in the quadruple helix model based on media and culture as well as civil society (Shahabuddin,

2015), the business community, and supply chains can create innovations so that they can improve financial performance (Melany et al., 2024). Based on the explanation provided above, this research hypothesizes that

H4: Civil society has a positive effect on the perceived financial performance of SMEs

In the business world, companies continually seek various strategies to encourage consumers to purchase their marketed products. In this competitive landscape, it is essential for each company to establish unique advantages over its rivals. Companies that effectively manage their intellectual capital can enhance the competitive advantage of SMEs. As a result, SMEs can thrive and expand by creating excellence through the optimal utilization of their resources. The higher the value of intellectual capital, the greater the competitive advantage of SMEs, which will, in turn, positively impact their financial performance. According to Aljumah et al. (2022), research indicates that a company's competitive advantage can mediate the relationship between intellectual capital and company performance. Similarly, Jeong & Chung's research (2023) suggests that competitive advantage mediates the influence of intellectual capital on financial performance. Based on this information, the following hypothesis can be proposed:

H5: Competitive advantage mediates the influence of intellectual capital on the perceived financial performance of SMEs

The government's role is crucial because it has the authority to develop SMEs (Jayeola et al., 2022) through both central and regional governments, as well as to establish substantive and administrative linkages. Synergy and cooperation between the central and local governments are essential for creating SMEs that possess a strong competitive advantage, thereby enhancing their financial performance (Abid et al., 2023). As part of the quadruple helix model, the government plays a significant role in mobilizing the community through policies designed to bolster the competitive advantage of SMEs, ultimately leading to improved financial outcomes for these enterprises (Jeong & Chung, 2023). Based on this discussion, the hypothesis for this research is

H6: Competitive advantage mediates the influence of the government on the perceived financial performance of SMEs

The business sector, which comprises organizations that sell goods or services to people, plays a crucial role. The dynamics of business activities across various sectors, particularly in SMEs, are influenced by social and innovation factors that enhance talent and creativity, which in turn affect economic performance (Chauhan et al., 2021). The involvement of different sectors in business activities can significantly bolster SMEs' ability to gain a competitive advantage, thereby positively impacting their performance. Based on this context, the hypothesis of this study is

H7: Competitive advantage mediates the influence of business activities on the perceived financial performance of SMEs.

Innovations in the quadruple helix model, which includes media, culture, civil society (Dahmiri et al., 2023), the business community, and the supply chain, can enhance competitive advantages and improve the financial performance of SMEs (Herlinawati & Machmud, 2020). The quadruple helix innovation theory focuses on the mechanisms of innovation, economic growth, productivity, and technology. Civil society plays a critical role in supporting the green market by influencing lifestyle changes, consumption behaviors, and participation in institutional arrangements, which can lead to the creation of competitive advantages and are expected to positively impact financial performance (Chauhan et al., 2021). Strong business

relationships in the creative industry encourage creativity and new ideas by getting people involved in the community. At the same time, the funding supply chain contributes to competitive finance and enhances financial performance (Menne et al., 2022). Based on this discussion, the hypothesis of this research is

H8: Competitive advantages mediate the influence of civil society on the perceived financial performance of SMEs

3. Methodology

The population of this study covers all SMEs spread across nine districts in Bali, with a total recorded population of 122,941 SMEs. To anticipate the heterogeneity of economic characteristics in the Bali region, the population is classified into four main sector strata according to data from the Cooperative and SME Office, including trade (33,264 units), agriculture (34,641 units), non-agricultural industry (19,277 units), and various services (35,759 units). This study uses a two-stage stratified random sampling method to ensure the representativeness of the data and the external validity of the research results. In the first stage, the sampling framework was formally obtained through the Bali provincial cooperatives and SMEs office. The determination of the sample size was set at a minimum of 399 SMEs. In the second stage, the researcher applied a proportional allocation in each industrial stratum so that the sample structure reflects the real conditions of the population.

Table 2. Sample Proportion Allocation

Key Sectors	SME Population	Percentage (%)	Selected Sample Allocation
Trade	33,264	27.06	108
Agriculture	34,641	28.18	112
Non-Agricultural	19,277	15.68	63
Various services	35,759	29.09	116
Total	122,941	100	399

Based on the proportional calculation in Table 2, the sample was objectively distributed to 108 trade SMEs, 112 agricultural SMEs, 63 non-agricultural industry SMEs, and 116 non-service SMEs.

The data analysis in this study employs SEM (Structural Equation Modelling) using the PLS program. PLS is a robust method for factor indeterminacy analysis, as it does not require the data to adhere to a specific scale and can accommodate small sample sizes. Additionally, PLS can be used to validate theoretical frameworks. One of the key advantages of PLS-SEM is its capability to handle complex models featuring multiple exogenous and endogenous variables with numerous indicators. It is also suitable for small sample sizes and can effectively address variables of nominal, ordinal, and continuous types.

The measurements for each variable in this study are shown in Table 3 below.

Table 3. Variable Measurement

Construct Variables & Properties	Indicator		Theoretical mapping	References
Intellectuals (First-Order Formative)	1. Mentoring	✓	Measuring the depth of knowledge transfer from academics to SMEs	Nor et al. (2025) (2025)
	2. Management Concept			
	3. Networking	✓	Measuring the effectiveness of the adoption of	Yun & Liu (2019)

		governance concepts from academics to SMEs	
		✓ Measuring the accessibility of SMEs to external research networks	
Government (First-Order Formative)	1. Government regulation 2. Law 3. Policy	✓ Measuring how regulation creates favorable barriers ✓ Legal compliance aspects to reduce operational cost risk ✓ Measuring the effectiveness of public incentives/subsidies policies for SMEs	Yun & Liu (2019) Li et al. (2023)
Business (First-Order Formative)	1. Collaboration 2. Protection 3. Business climate	✓ Measuring the depth of relational and supply chain integration ✓ The aspect of relational security is the protection of Shared assets so that they are not easily exploited by competitors ✓ Aspects of the effectiveness of the local market ecosystem that support competitiveness	Yun & Liu (2019) Li et al. (2023)
Civil Society (First-Order Formative)	1. Potential users 2. Culture 3. Social Media Communication	✓ Users as co-creators of community-based innovation ✓ Aspects of value alignment with local social capital ✓ Accessibility and reputation aspects in the digital age	Yun & Liu (2019) Li et al. (2023)
Competitive Advantage (Reflective)	1. Price/Cost 2. Innovative Product 3. Customer Relationship 4. Difference	Standard reflective indicators to measure cost advantages, product differentiation, and customer locking	Chen (2025)
Perceived Financial Performance (Reflective)	1. Subjective ROA 2. Subjective ROI 3. Subjective ROE	Validating subjective performance assessments (ROA, ROI, ROE perception) is very accurate in reflecting the real competitiveness of SMEs	Farrington, (2017). Kozubíková et al. (2023).

This study establishes the four dimensions of the quadruple helix as a formative construct, considering: 1) Direction of causality. The indicator transitions from being an individual measure to representing the overall construct. Changes in the indicator cause changes in the value of the construct. 2) Interchangeability. The indicators in formative construction do not replace each other because each captures the unique aspects of the four pillars of the helix. 3) Correlation between indicators. Formative indicators do not require high correlation.

Meanwhile, competitive advantage and perceived financial performance are specified as reflective constructs. This approach is because on a subjective scale it acts as a covariate manifestation and reflects the same latent construct.

The measurement of financial performance in this study uses subjective indicators, namely the perception of business actors on their ROA, ROI, and ROE. This approach is taken by considering the condition of SMEs in developing countries, especially in the Bali region, most of which do not have a formal accounting system or audited financial statements. Forcing SMEs to use objective data can result in a high rate of missing or inaccurate information because their financial records are often intertwined with personal finances.

Nonetheless, the researcher realized that subjective measures are susceptible to optimism bias and common method bias because performance data and independent data were obtained from the same source, namely self-questionnaires from owners. To mitigate these limitations and ensure the validity of the data, this study implements several procedural protection measures, including 1) ensuring the confidentiality of respondents' identities and data. 2) Separating the location of the financial performance variable question item from the independent variable in the questionnaire.

4. Result and Discussion

4.1 Response Rate

To anticipate the potential for questionnaires that are not returned or are incomplete, the researcher distributed as many as 450 questionnaires to selected SMEs in 9 districts. Of these, 417 questionnaires were successfully recollected. After carrying out the data cleaning stage, several questionnaires were found to be incomplete or double-filled, leaving as many as 399 questionnaires that were eligible for analysis. Thus, the final response rate is 88.60%. This response rate is above the minimum threshold required for organization-level empirical studies to mitigate the risk of non-response bias.

4.2 Descriptive Statistics

The description of each research variable according to the respondents' responses to the research instrument is shown in Table 4

Table 4. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Intellectuals	399	2	5	3.75	0.69
Government	399	1	5	3.49	0.79
Business	399	2	5	4.14	0.61
Civil society	399	1	5	3.25	0.87
Competitive Advantage	399	3	5	3.99	0.64
Perceived Financial Performance	399	2	5	3.93	0.67

Based on Table 4, the intellectuals variable has a mean value of 3.75 (high category). This indicates that most SMEs agree that training activities, internships, and diversification of university research products have a positive impact on their business insights. The government variable has a mean value of 3.49 (high category). The distribution of respondents' answers varied, as shown by a standard deviation of 0.79. The data show that there is a different perception among SME respondents regarding the effectiveness of capital assistance, ease of permits, or programs from the government. The business variable has a mean value of 4.14 with a standard deviation of 0.61. The data show that SME respondents perceive benefits from both the business aspect and the adoption of technology from large companies. A low

standard deviation value indicates that respondents' answers are very homogeneous. The civil society variable has a mean value of 3.25 with a standard deviation of 0.87. This shows that SMEs consider that all elements of civil society have not provided optimal support in supporting profit-generating business operations.

The competitive advantage variable has a mean value of 3.99. This shows that the majority of SMEs feel that they have a good competitive advantage, both in terms of product uniqueness, cost efficiency, and speed in responding to local market needs. The perceived financial performance variable has a mean value of 3.93. This reflects that the majority of SMEs experience sales growth, increased net profit, and healthy capital adequacy thanks to the combination of competitive advantage and the support of each pillar of the quadruple helix.

4.3 Pearson Correlation

Pearson correlation testing is carried out to determine the direction and strength of the relationship between the variables studied and to ensure that there are no symptoms of multicollinearity among independent variables. Table 5 illustrates the correlation values between variables.

Table 5. Pearson Correlation

Variable	Intellectuals	Government	Business	Civil Society	Competitive Advantage	Perceived Financial performance
Intellectuals	1					
Government	0.356	1				
Business	0.417	0.477	1			
Civil Society	0.299	0.313	0.387	1		
Competitive advantage	0.562	0.471	0.588	0.442	1	
Perceived Financial Performance	0.498	0.425	0.621	0.391	0.689	1

Based on Table 5 above, the correlation value of intellectuals to financial performance is 0.498. This data shows that there is a positive relationship with the medium category, where the higher the intellectual support, the perceived financial performance of SMEs tends to increase. The correlation value of government support to perceived financial performance is 0.425, indicating a positive relationship within the medium category; as government support for SMEs increases, their perceived financial performance also tends to improve. The business correlation value for perceived financial performance is 0.621, indicating a positive relationship in the strong category, where increased support from the business group for SMEs can enhance their perceived financial performance. The correlation value of civil society to perceived financial performance is 0.391, which indicates that there is a positive relationship with the weak category, where the higher the support from civil society, the greater the potential to improve the perceived financial performance of SMEs.

The support from intellectuals, government, business, and civil society as a whole positively correlates with competitive advantage, with correlation values of 0.562, 0.471, 0.588, and 0.442, respectively. The correlation value is in the medium to strong category, which indicates that the strengthening of these external aspects is in line with the increase in the competitive advantage of SMEs. The correlation value of competitive advantage to perceived financial performance is 0.689, which falls into the high category. This positive and strong correlation

value provides an early indication that supports competitive advantage as a potential mediator in the research model.

4.4 Common Method Bias (CMB)

CMB testing is carried out to mitigate and test bias statistically because data is collected from a single source (SME owner) at the same point and time, thus raising the risk of CMB occurring. The CMB test in this study uses a full collinearity assessment as seen from the Inner VIF value.

Table 6. Full Colinearity Test Results

Contract	Properties of Construction	Inner VIF Values	Critical Threshold	Conclusion
Intellectuals	Formative	1.977	≤ 3.3	CMB Free
Government	Formative	1.698		CMB Free
Business	Formative	2.322		CMB Free
Civil Society	Formative	1.571		CMB Free
Competitive Advantage	Reflective	2.471		CMB Free
Perceived Financial Performance	Reflective	1.989		CMB Free

Based on the results of the solid CMB analysis of Table 6, the inner VIF values of all major variables, both formative contracts (quadruple helix) and reflective contracts (competitive advantage and perceived financial performance), are consistently below the threshold of 3.3. These results prove that the self-reported data of 399 respondents in this study did not experience common method bias (CMB). Thus, the structural relationships produced by this model purely reflect the real function of the helix ecosystem and internal capabilities, not as a result of the biases of the respondents' homogeneous subjective perspectives.

4.5 Formative Construct (Quadruple Helix)

The evaluation of the measurement model of independent formative variables (intellectuals, government, business, and civil society) was carried out through three stages of testing, namely: redundancy analysis, collinearity test (VIF) and outer weights. Table 7 is the results of the evaluation of formative constructs.

Table 7. Formative Construction Evaluation

Variable	Indicator	VIF	Outer Weight	P-Value	Outer Loadings
Intellectuals	Mentoring	1.422	0.416	0.000	0.807
	Management Concept	1.515	0.381	0.002	0.798
	Networking	1.397	0.314	0.016	0.711
Government	Regulation	1.661	0.512	0.000	0.877
	Law	1.719	0.317	0.019	0.725
	Policy	1.577	0.455	0.001	0.831
Business	Collaboration	1.315	0.470	0.000	0.851
	Protection	1.287	0.389	0.003	0.788
	Business Climate	1.449	0.279	0.021	0.689
Civil Society	Potential Users	1.231	0.480	0.000	0.859
	Culture	1.192	0.372	0.005	0.771
	Social Media Communication	1.249	0.289	0.019	0.721

The results of the collinearity test (VIF) in Table 7 show that the VIF value for all indicators is below 3.3. This proves that there is no significant conceptual overlap between the indicators, so the specification of this formative model is completely valid and proceeds to the structural analysis. Meanwhile, all indicators have significant outer weight values (p-value < 0.05),

Table 8. Redundancy Analysis

Formative constructs	Path coefficient (ß)	Minimum Limit	Conclusion
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Intellectuals	0.763	≥ 0.70	Valid
Government	0.751		Valid
Business	0.789		Valid
Civil Society	0.747		Valid

The test results in Table 8 show that the path coefficient (β) values for each pillar exceed the 0.70 threshold. The intellectual pillar has a β value of 0.763; government, 0.751; business, 0.789; and civil society, 0.747. These results demonstrate that all formative constructs meet the ideal criteria for convergent validity.

4.6 Reflective Construct (Competitive Advantage and Perceived Financial Performance)

The initial step of evaluation was carried out by examining the standardized root mean square residual (SRMR) to test the alignment of the model, as well as the heterotrait-monotrait ratio (HTMT) criteria to ensure the discriminant validity of the reflective construct. Reflective constructs were evaluated using Cronbach's alpha, composite reliability, and average variance extracted (AVE).

Table 9. Heterotrait-Monotrait Ratio (HTMT)

Construct	Competitive Advantage	Perceived Financial Performance
Competitive Advantage	-	
Perceived Financial Performance	0.687	-

The structural model shows that the SRMR value of 0.063 is below 0.08. This indicates that the model has a good level of fit and is not biased in specifications. In addition, based on Table 9, the discriminatory validity test using the HTMT ratio between competitive advantage and perceived financial performance yielded a value of 0.687, below the limit of 0.85. Thus, the discriminant validity between reflective constructs in this model has been fully fulfilled

Table 10. Reflective Construction Evaluation

Variable	Cronbach's Alpha	Composite Reliability	AVE
Competitive Advantage	0.855	0.893	0.681
Perceived Financial Performance	0.892	0.921	0.780

Based on the results of the reflective construction evaluation in Table 10, all Cronbach's alpha and composite reliability values are above 0.7, and AVE values are above 0.5, so the reflective measurement instruments have excellent internal reliability and convergent validity.

4.7 Evaluation of Inner Model

The explanatory quality of the model was evaluated using the determination coefficient (R^2), adjusted R^2 , and the effect size (f^2).

Table 11. R^2 and Adjusted R^2 values

Endogenous Variable	R	Adjusted R^2	Categories
Competitive Advantage	0.456	0.432	Moderate
Perceived Financial Performance	0.580	0.561	Moderate

Based on Table 11, the value of R^2 for perceived financial performance is 0.580, which means that 58% of the variation in perceived financial performance can be explained simultaneously by intellectuals, government, business, civil society, and competitive advantage; the remaining 42% is explained by factors outside the model.

The relative contribution of each predictor is assessed by the effect measure (f^2) on the endogenous variables shown in Table 12.

Table 12. Value of Effect Size (f^2)

Variable Relationships	Value f^2	Category Effect Size
Intellectuals → Competitive Advantage	0.187	Medium Effect

Government → Competitive Advantage	0.155	Medium Effect
Business → Competitive Advantage	0.313	Medium Effect
Civil Society → Competitive Advantage	0.047	Small Effect
Intellectuals → Perceived Financial Performance	0.351	Large Effect
Government → Perceived Financial Performance	0.157	Medium Effect
Business → Perceived Financial Performance	0.371	Large Effect
Civil Society → Perceived Financial Performance	0.001	No Effect

Based on the results of the effect size test (f^2) in Table 12, each exogenous variable has a different level of impact on the endogenous variables. The influence of intellectuals and businesses on perceived financial performance falls into the large effect size category. This means that academia and the active involvement of the industrial sector are the main drivers of the achievement of SME financial performance. The influence of government on perceived financial performance has a moderate effect size. The study indicates that government policies positively contribute to the performance of SMEs, although this contribution is moderate. Meanwhile, the influence of civil society on perceived financial performance has no effect. The study indicates that the role of civil society or local communities has not been able to have a significant practical impact on the financial performance of SMEs.

The influence of intellectuals, government, and business on competitive advantage has a moderate effect size. The data indicate that the role of academics, government policies, and the active involvement of organizations contributes sufficiently to the competitive advantage of SMEs. Meanwhile, civil society's influence on competitive advantage has a small effect size. This indicates that the role of the community has a small impact on the competitive advantage of SMEs.

4.8 In-Sample (Q^2) and Out-of-Sample (PLSpredict) Predictive Revelation

To test the predictive ability of the model, this study applied a blindfolding procedure to obtain a Q^2 (in-sample) value as well as a PLSpredict procedure to evaluate the predictive power of out-of-sample. The Q^2 value for competitive advantage is 0.322, and perceived financial performance is 0.416. Because both Q^2 values > 0 , the model is proven to have good in-sample predictive relevance.

The PLSpredict procedure was performed on 399 samples using 10-fold cross-validation with 10 repetitions. The following Table 13 is the result of the PLSpredict evaluation.

Table 13. PLSpredict Evaluation Results

Reflective Indicator	RMSE (PLS_SEM)	RMSE (Linear Model/LM)	Difference (PLS-LM)	Predictive Power
Competitive Advantage (CA)				
CA1	0.413	0.452	-0.039	Lower (High)
CA2	0.387	0.413	-0.026	Lower (High)
CA3	0.462	0.487	-0.025	Lower (High)
CA4	0.366	0.399	-0.033	Lower (High)
Perceived Financial Performance (PFP)				
PFP1	0.317	0.362	-0.045	Lower (High)
PFP2	0.331	0.377	-0.046	Lower (High)
PFP3	0.297	0.311	-0.014	Lower (High)

Based on Table 13, all total indicators in the reflective endogenous contrast resulted in lower RMSE values in the PLS-SEM model compared to the LM model. These results confirm that this model has high out-of-sample predictive power.

4.9 Direct Effect Test Results

The evaluation of the structural model of this research was carried out through the PLS-SEM approach. To test the significance of the hypothesis (direct and mediated effects), a complete bootstrapping procedure was applied with a full setting of 5000 bootstrap samples (subsamples), using the two-tailed test option, a significance level of 5%, and an estimated bias-corrected and accelerated (BCa) bootstrap confidence interval. This setting is chosen to produce a robust standard error estimate and minimize the bias of non-normal data distributions.

Direct effect testing was used to answer hypotheses 1 to 4, namely the influence of each quadruple helix pillar on perceived financial performance. The test results are displayed in Table 14.

Table 14. Direct Effects test results

Path Relationships	Path Coefficient	T-Statistics	P-Value
Intellectuals → Perceived Financial Performance	0.286	4.122	0.000
Government → Perceived Financial Performance	0.196	2.949	0.003
Business → Perceived Financial Performance	0.339	5.209	0.000
Civil Society → Perceived Financial Performance	0.047	0.685	0.491
Intellectuals → Competitive Advantage	0.246	3.121	0.002
Government → Competitive Advantage	0.116	2.012	0.043
Business → Competitive Advantage	0.383	5.021	0.000
Civil Society → Competitive Advantage	0.141	2.349	0.019
Competitive Advantage → Perceived Financial Performance	0.046	6.132	0.000

Based on the results of the direct effects test in Table 14, intellectuals had a path coefficient value of 0.286 with a significance of 0.000. The result proves that pillar intellectuals have a positive effect on perceived financial performance, so hypothesis 1 is accepted. The government has a path coefficient value of 0.196 with a significance of 0.003. The data prove that the government has a positive effect on perceived financial performance, so hypothesis 2 is accepted. Business has a path coefficient value of 0.339 with a significance of 0.000. The data prove that business has a positive effect on perceived financial performance, so hypothesis 3 is accepted. Meanwhile, civil society has a path coefficient value of 0.047 with a significance of 0.491. This finding shows that civil society does not affect perceived financial performance, so hypothesis 4 is rejected.

The quadruple helix pillar, namely intellectuals, government, business, and civil society, has a positive effect on competitive advantage, which is shown by significance values (0.002, 0.043, 0.000, and 0.019, respectively) less than 0.05. Then, competitive advantage influences perceived financial performance because it has a significance value of 0.000 that is smaller than 0.05.

4.10 Mediation Effect Results

The mediation effect test was carried out to answer hypotheses 5 to 8, namely the role of competitive advantage (CA) in mediating the influence of each quadruple helix pillar on perceived financial performance. The test results are displayed in Table 15;

Table 15. Mediation Analysis Results

Mediation Pathway	Direct Effects (P-Value)	Indirect Effects (P-value)	Total Effect (P-value)	95% Confidence Interval (LL-UL)
Intellectuals → CA → Perceived financial performance	0.286 (0.000)	0.146 (0.000)	0.432 (0.000)	0.086 ; 0.211

Government → CA → Perceived financial performance	0.196 (0.003)	0.094 (0.021)	0.290 (0.001)	0.026 ; 0.167
Business → CA → Perceived financial performance	0.339 (0.000)	0.179 (0.000)	0.518 (0.000)	0.117 ; 0.247
Civil Society → CA → Perceived financial performance	0.047 (0.491)	0.113 (0.015)	0.160 (0.023)	0.032 ; 0.199

Note: CA= competitive advantage; LL-lower level; UL= upper level

The analysis in Table 15 shows the results for intellectuals, government, and business concerning the variable of competitive advantage as a mediator. Based on the indirect effect of competitive advantage as a mediator between intellectuals, government, and business on perceived financial performance, the significance values are 0.000, 0.021, and 0.000 (significant). In direct effect, intellectuals, government, and business on perceived financial performance have significance values of 0.000, 0.003, and 0.000, with all path coefficients having positive values, so it can be concluded that competitive advantage mediates and has a complementary partial mediation influence on intellectuals, government, and business regarding perceived financial performance. Meanwhile, the indirect effect of competitive advantage as a mediator between civil society and perceived financial performance is significant, with a value of 0.015. The direct effect of civil society on perceived financial performance has a significance value of 0.491 (insignificant), so the competitive advantage mediates and is indirect-only, with full mediation.

4.11 Robustness Check

To ensure yield resilience and overcome potential endogeneity issues, this study applied the Gaussian copula approach. This approach was chosen over conventional methods such as variable (IV) or 2SLS instruments because of the inherent difficulty in finding valid and truly exogenous external instruments in the context of SME survey data. The fundamental assumption of the Gaussian copula method is the correlation between the explanatory variable (regressor) and the error term modeled using the shared distribution function. The main condition of identification in this method is that the explanatory variable indicated as endogenous must have an abnormal distribution. Before applying this method, researchers evaluated the assumption of non-normality using the Shapiro-Wilk test. The test results showed that all explanatory variables, namely intellectuals (p-value = 0.001), government (p-value = 0.006), business (p-value = 0.021), civil society (p-value = 0.012), and competitive advantage (p-value = 0.009), had a significance smaller than 0.05, so they were not normally distributed. With the fulfillment of the abnormal data characteristics, the absolute requirements for the Gaussian copula estimation have been fully met so that the endogeneity correction analysis can be validly performed.

Table 16. Gaussian Copula Terms

Item	Path Coefficient	T-statistics	P-Value
Intellectuals	0.037	0.620	0.535
Government	0.032	0.472	0.689
Business	0.017	0.361	0.710
Civil Society	0.019	0.299	0.778
Competitive Advantage	0.044	0.531	0.602

All copula terms tested in the model were shown to have no statistically significant effect on perceived financial performance. The p-values for copula intellectuals (p-value = 0.535), government (p-value = 0.689), business (p-value = 0.710), civil society (p-value = 0.778), and competitive advantage (p-value = 0.602) were above 0.05. The results of this analysis prove

that the structural error term of the dependent variable does not correlate with the external explanatory variables. Thus, this model is free from endogeneity problems.

Table 17. Robustness Check Gaussian Copula

Structural Relationship Pathway	Path Coefficient	T-statistics	P-Values
Intellectuals→Perceived Financial Performance	0.277	3.907	0.000
Government→Perceived Financial Performance	0.178	3.012	0.002
Business→Perceived Financial Performance	0.201	4.576	0.000
Civil Society→Perceived Financial Performance	0.078	0.653	0.522
Competitive advantage→Perceived Financial Performance	0.417	5.722	0.000

The stability and consistency of the main path coefficient model were strengthened by comparing the values of the path coefficients before and after the inclusion of copula terms. The coefficient values for intellectuals (0.277), government (0.178), and business (0.201) remained stable with positive and significant values. These results are almost identical to the results of the main hypothesis test. Likewise, the value of the civil society coefficient (0.078) has consistently been proven to have no direct effect on perceived financial performance. Meanwhile, the value of the path coefficient from competitive advantage to perceived financial performance remains solid and significant. This confirms that VRIO's internal capabilities are indeed the main drivers of SME financial performance.

Substantively, the results of this robustness check confirm that the variation in perceived financial performance in 399 SMEs is purely triggered by the logical configuration of the external relational resources analyzed in the model (quadruple helix) and not due to the presence of other external or internal factors that are deliberately hidden (omitted variables). This result provides a very strong empirical foundation for the resource-based view (RBV) because parameter estimation has proved to be stable, reliable, and ready to be used as a basis for managerial decision-making and SME policymakers.

4.12 Discussion

The results of this study demonstrate that the intellectual pillar shows a statistically significant positive association with perceived financial performance. These results indicate that a combination of mentoring, the application of management concepts, and academic networks acts as a driver of SME economic growth. Governance knowledge transferred from academics enables SMEs to optimize their internal operational efficiency, minimize waste of raw materials, and directly increase asset returns. From the perspective of RBV, scientific knowledge, mentoring, and management concepts provided by academics are tangible resources of knowledge. This knowledge is abstract and not inherently part of SMEs. Therefore, the capability ability to absorb it is essential for transforming it to absorb it so that it turns into a valuable asset.

Regarding another pillar of the quadruple helix—the government—analysis reveals a statistically significant positive association with perceived financial performance. Regulations, legal compliance, and incentive policies adopted by SMEs have been shown to reduce operational transaction costs. Government-provided access to fiscal subsidies and streamlined business licensing processes offer financial support and lower overhead costs while also being closely linked to increased investment profitability for business operators. From a resource-

based view (RBV) perspective, government interventions—such as subsidy facilities or simplified work permit management—provide legal legitimacy to SMEs.

Analysis reveals that the third pillar of the quadruple helix, business, shows a statistically significant association with the perceived financial performance of SMEs. Commercial collaboration, market protection, and a healthy business climate can establish a robust financial foundation. Synergy among business players provides SMEs with stability regarding raw material supplies at competitive prices and direct access to large-scale distribution networks. This supply chain efficiency immediately shortens the cash conversion cycle and is closely linked to improved SME equity performance (return on equity).

Meanwhile, the fourth quadruple helix pillar, namely civil society, based on the results of the analysis, proves that it has no effect on perceived financial performance. Theoretically, these formative indicators such as culture, potential user interaction, and social media communication are long-term and based on emotional relationships (social capital). Although this social capital is valuable for public image, it is often common and easy to imitate. Intensive social activities and digital communication on social media require marketing operational expenses at the beginning but do not necessarily immediately convert into cash sales transactions that boost finances in the short term.

The results of the analysis prove that competitive advantage mediates the influence of the pillar intellectuals, government, and business on perceived financial performance, which is complementary partial mediation. In accordance with the VRIO framework, the external assets of the three pillars are first converted by SMEs into innovative products, price efficiency, and market capitalization. A well-organized competitive advantage is closely linked to improved financial performance for SMEs. Academic knowledge is initially abstract and outside SMEs. SMEs have the capability to absorb academic knowledge, allowing their intellectual capital to transform into valuable assets by reducing production inefficiencies, especially when the adopted research is exclusive. Mediators of competitive advantage prove the RBV perspective, namely that academic knowledge must first be converted into product uniqueness or internal process efficiency before it materializes in the form of profits.

Interesting findings in this study show that civil society is proven to have an indirect-only mediation influence on perceived financial performance through competitive advantage. This means that the involvement of civil society, local communities, and the social capital created in it does not have the ability to directly increase the profitability of SMEs, but this influence must be fully bridged by the formation of competitive advantage first. Theoretically, this phenomenon can be explained through RBV. Civil society involvement in the quadruple helix ecosystem contributes to the creation of relational and cognitive social capital for SMEs, such as public trust, social legitimacy, community networks, and local value-based loyalty. Based on the RBV's perspective, this social capital is a valuable and rare asset, but it is still in the form of a latent and intangible asset. The social capital of civil society cannot be directly converted into financial income before SMEs are able to convert it into dynamic capabilities that distinguish it from competitors. When SMEs take advantage of this community support to create market repositioning, for example through product differentiation based on local wisdom, solid word-of-mouth marketing strategies, or brand legitimacy, social capital can be converted into competitive advantage.

This strong competitive advantage serves as an operational driver to attract a loyal customer base, lower consumer acquisition costs, and ultimately lead to efficiency and increased financial results. These findings are in line with the research of Chauhan et al. (2021) and

Menne et al. (2022) and affirm that relational capital from the environmental community does not necessarily improve financial performance without the strategic uniqueness adopted by SMEs. Therefore, civil society is the foundation of reputation, while competitive advantage is a bridge to commercialization that turns that reputation into financial gain.

5. Conclusion and Suggestion

Based on the analysis and discussion regarding the role of the quadruple helix pillars, namely intellectuals, government, business, and civil society, in the financial performance of SMEs and the mediating role of competitive advantage, it can be concluded that three of these pillars (intellectuals, government, and business) are closely linked to improvements in perceived financial performance. In contrast, civil society does not show a strong association with improvements in SMEs' perceived financial performance. Commercial synergy with business partners has proved to have a powerful relationship with enhancing SMEs' perceived financial performance. Furthermore, competitive advantage plays a central role in mediating the impact of the four quadruple helix pillars on SMEs' perceived financial performance. External support from intellectuals, government, and business will strongly correlate with improved perceived financial performance if SMEs are able to transform this support into independent competitive capacity, whether through product differentiation strategies or cost efficiency.

These findings suggest that SME managers and owners should collaborate with intellectuals, government, and business networks to achieve good financial results. However, this implication must be addressed carefully. Given the cross-sectional nature of the data, there is a possibility of reverse causality, meaning that established and financially successful SMEs may have more resources and capacity to initiate and fund such external collaborations compared to SMEs whose performance is still limited.

6. Limitations and Future Research

This study uses a cross-sectional survey design, so the relationships between variables should be interpreted as statistical associations and not definite causal relationships. Subsequent research is recommended using a longitudinal design or experimental studies to test these cause-and-effect relationships in more depth.

Declaration of AI and AI-assisted technologies in the writing process (if author[s] utilize AI)

During the preparation of this work, the author(s) used QuillBot in order to assist in proofreading, refining the grammatical structure, and improving the overall readability of the manuscript text. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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