

The Impact of Intellectual Capital on SMEs Performance in Pakistan: Moderating Role of Digital Transformation

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Abstract

Small and medium-sized enterprises (SMEs) are considered the backbones of several economies in terms of employment, economic turnover and economic development. It is essential to know how the firm's resources, tangible and intangible, affect SMEs performance. This research aims to examine the impact of Intellectual Capital(IC) on SMEs Performance in Pakistan with the moderating role of digital transformation (DT). Modern statistics confirm significant growth in the sphere of digitization, and to understand what degree human, structural, and relational capital drives the performance of SMEs and to which degree DT regulates these processes, this matter is to be investigated. Empirical investigation adopted a survey methodology, which involved responses of SMEs leaders across different industries in Pakistan. The analytical results prove the fact that all the intellectual capital facets human, structural and relations perform have a positive impact on the SMEs performance, and DT actually increases these connections significantly. The study hence highlights the synergetic role of digital transformation and intellectual capital management and how they can be actively used by SMEs in Pakistan seeking to improve their organizational performance.

Keywords: Intellectual Capital (IC), Digital Transformation (DT), SMEs Performance

INTRODUCTION

Small and medium-sized enterprises (SMEs) are considered important drivers of economic development (Raihan et al., 2023a). SMEs businesses are important to the global economy, contributing to a large share of the labor force and economic output. However, multiple factors, such as intellectual capital and digital transformation, will likely impact these organization's success and development (Jeza & Lekhanya, 2022). Numerous SMEs have adopted new technologies, particularly those engaged in digital transformation, to enhance operational efficiency, customer interaction, and innovation (Kraus et al., 2022; Plekhanov et al., 2023; Vial, 2021). Simultaneously, intellectual capital has also become an important factor in organizational success, as it includes intangible factors, that determine innovation, productivity, and

competitive advantage (Bontis, 1998; Obeidat et al., 2021; Rehman et al., 2022). Commonly restricted SMEs, due to limited physical and capital facilities, are finding it necessary to use their human, structural, and relational capacity in addressing these dynamics (Edvinsson & Malone, 1997; Prasanna et al., 2019).

The growing trend to use technologies provides a good opportunity to SMEs to improve their operational abilities (Kane et al., 2015). Nevertheless, DT is not a sufficient condition that asserts successfulness, on the contrary, its ability to lead to long-term sustainability is particularly effective when implemented alongside a strong background of intellectual capital (Alvino et al., 2021; Teece, 2018). By combining two potentially significant resources, SMEs will be ready to not only plan their reinforcement of internal operations but also help to adjust in dynamic market and create value (Martínez-Peláez et al., 2023; McAfee & Brynjolfsson, 2017).

Among the most prominent issues that SMEs deal with is how to measure and manage intellectual capital effectively, even though its relevance is widely recognized (Demartini & Beretta, 2020; Dumay & Garanina, 2013). Human capital comprising employees knowledge, expertise and experiences are normally regarded as the most important asset of SMEs (Chinomona, 2013; Subramaniam & Youndt, 2005). Other intangible capital resources such as structures, organizational processes, systems, and patents, among others are referred to as structural capital, and help smoothly run activities and innovate (Beltramino et al., 2020; Bontis, 1998; Cabrilo & Dahms, 2018). Lastly, relational capital which includes networks, customer relationships and brand reputation are also vital towards SMEs sustainability especially in competitive markets (Agostini, Nosella, & Soranzo, 2017; Nahapiet & Ghoshal, 1998; Zahoor & Gerged, 2021).

Numerous SMEs neglect to manage or quantify intellectual capital, thereby missing out on leveraging it for digital transformation (Demartini & Beretta, 2022; Mertins et al., 2006). DT has the potential to automate processes, and improve decision-making and it is important for SMEs in intellectual capital development, as it can ensure sustainable development (Baimukhamedova & Baimukhamedov, 2023; FAISAL et al., 2023; Markevičius, 2025). According to previous studies, those SMEs that invest in digital transformation and human capital development enhance productivity, and innovation (Accenture, 2022; Iyelolu et al., 2024; Jevtic et al., 2020; Teng et al., 2022; Zhang et al., 2022).

The moderating role of digital transformation on this relationship between IC and performance of SMEs is still unexplored research topic (Ali et al., 2025; Kane et al., 2015; Le et al., 2024; Vo & Tran, 2024). SMEs can enhance their performance, such as profits, customer relationship, and meeting ESG goals, by utilizing digital tools to optimize their intellectual assets. (Akhtar et al., 2025; Chen & Wang, 2024; Katsinis et al., 2024.).

The impact of these factors on Pakistani SMEs is still emerging. According to the empirical research, the problems that cripple the rational utilization of human, structural, and affectionate capitals in Pakistani SMEs include unrepairable struggles with digital infrastructure, insufficient training, and less mature policy frameworks (Khaliq et al., 2020; Khattak et al., 2024). The existence of the digital gap between big companies and SMEs intensifies the problem by leaving numerous SMEs unprepared technologically (Ali et al., 2025; Baimukhamedova & Baimukhamedov, 2023). The purpose is to address such gap of context linked with specific conditions and the challenges faced by Pakistani SMEs in the evolving digital economy (Khaliq et al., 2020; Shahbaz et al., 2025).

Objectives

This study has been developed aligning with key objectives,

- To evaluate the key impact of the intellectual capital (human, structural, and relational) on SMEs' performances.

- *To analyse* the moderating role of digital transformation on intellectual capital and SMEs performance
- *To provide* brief recommendations for the growth of SMEs by utilizing the intellectual capital.

LITERATURE REVIEW

Intellectual Capital in SMEs

Intellectual capital (IC) is a very pivotal type of intangible asset for SMEs, encompassing human, structural, and relational capital (Bansal et al., 2023). Human Capital refers to the knowledge, skills, and expertise particularly possessed by employees (Kumcu et al., 2025). Structural capital entails the organizational systems and processes and technologies, which promote the effective human capital application and boost the functioning (Beltramino et al., 2020; Ngugi, 2014). Relational capital represent the external affiliations with the customers, suppliers, and partners (Demartini & Beretta, 2020; Sardo & Serrasqueiro, 2019). A combination of these elements positively affects the competitiveness of SMEs by promoting innovation and making organizations more efficient (González-Loureiro & Dorrego, 2012; Urban & Joubert, 2017).

Digital Transformation in SMEs

Digital transformation (DT) is the integration of digital technologies across all facets of an organization, to easily streamline activities in the process generating value to customer (Garzoni et al., 2020; Koumas et al., 2021; Omrani et al., 2022). Emerging technologies promote innovation, optimizing decision-making, and developing customer-tailored experiences (AlMujaini et al., 2021; Bhuiyan et al., 2024; Islam et al., 2023). DT significantly enhances productivity by automating repetitive tasks, improving resource utilization, and improves the efficiencies during operations (Kim & Ha, 2023; Mai et al., 2024). Moreover, DT enable SMEs, increases the competitiveness in the market, provide high value propositions, and have access to global markets and hence sustainability and growth (Elsa et al., 2025; Philbin et al., 2022) (Philbin & Viswanathan, 2022; Elsa et al., 2025). With these advancements, small businesses can swiftly adapt, boost growth, and enhance competitiveness. (Cleary, 2015; Dong et al., 2025; Fedderke, 2005).

Intellectual Capital (IC) & Digital Transformation (DT)

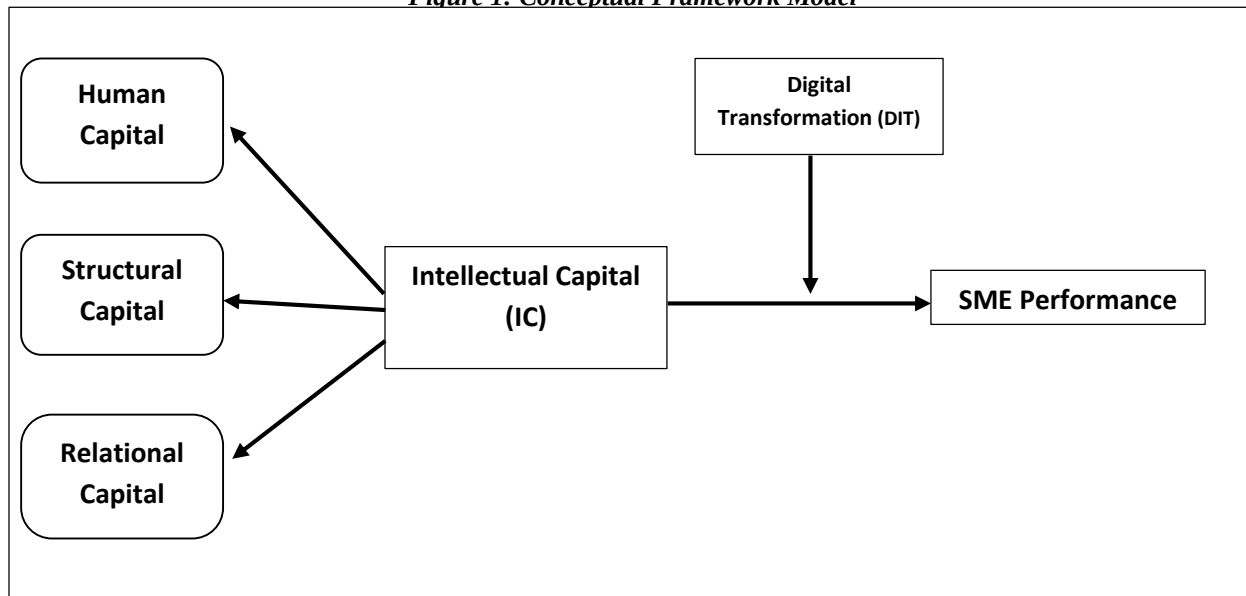
Intellectual Capita is vital for innovation and improving performance (Bansal et al., 2023; Xu & Li, 2019). Empirical studies shows that DT and IC together have the potential to contribute to a major increase in firm performance especially in the ability to innovate as well as in developing a sustainable business growth (Demartini & Beretta, 2020; Shahbaz & Malik, 2025). Additionally, synergy between the factors would allow SMEs in adapting to changes in environment in a better manner (Aljuboori et al., 2021; Sohail Rana & Hossain, 2023; Vo & Tran, 2024). Such approach towards integration forms a strong framework to support the SMEs as they can rely on the intangible assets and even on the digital tools, to have better results in terms of their performance. DT also leads in maximizing the effects of IC on innovation because it helps the SMEs deploy and streamlining their intellectual resources (Le et al., 2024; Yang & Gong, 2025). Such synergy enables faster reaction to market developments and leads to the constant innovation due to the enhanced decision-making and knowledge dissemination (Shahbaz et al., 2025; Vo & Tran, 2024). By integrating DT with IC, SMEs will be in a better position to operate their business to gain competitive advantage and generate sustainable practices and permanent

growth under the pressure of an ecologically sustainable and digital economy (Ali et al., 2025; Awwad, 2025).

Research Gap

The majority of studies consider DT as the direct, almost causal, influence on performance, instead of the interaction with IC elements, which lead to enhanced innovation and organizational performance (Le et al., 2024; Shahbaz et al., 2025). In addition, the sectoral effect of DT in low-technology-intensive industries, or in service-based SMEs, is poorly examined (Awwad, 2025; Demartini & Beretta, 2022). DT moderating role in enhancing the influence of intellectual capital on SMEs performance has been studied insufficiently (Bansal et al., 2023; Xu & Li, 2019). The highlighted gaps present a significant potential for future research to understand the nature of effective moderation of digital transformation on IC and SMEs performance (Kim & Ha, 2023; Kim & Tran, 2024).

Figure 1: Conceptual Framework Model



Theoretical Framework

The **Resource-Based View (RBV)** theory posits that a firm's competitive advantage stems from valuable, rare, inimitable, and non-substitutable resources including intellectual capital (Barney, 1991; Teece, 2014). The strategic resources built on IC through its components are the basis on which the SMEs can utilize in improving their performance (Guerrero et al., 2022; Hayton, 2003; Thatrak, 2021; Voca & Havolli, 2019). RBV states that IC can be treated as a strategic resource because it becomes a source of competitive advantage under proper management. Nevertheless, it is the combination of these intangible resources which actually provides SMEs competitive edge (Lu et al., 2024; Nguyen Van et al., 2023). IC in this respect is regarded as more than a resource

but a strategic asset than can be used by SME to create and sustain competitive advantage in dynamic environment (Daou et al., 2013; Khattak et al., 2024; Muda et al., 2020).

Dynamic capabilities theory (DCT) focuses more on the firm ability to merge, create and reconstruct the internal as well as external competencies to adapt to fast-evolving environments (Teece, 2007). Advancements in digital technologies, SMEs could reorganize intellectual capital to address the challenges set by the market dynamic environment (Cen & Lin, 2025; Kraaijenbrink et al., 2010; Nguyen & Le, 2025). Human capital may be enhanced through AI and big data that makes information and decision-making tools available to the employees in real-time, enabling informed and quick innovation (Lu & Shaharudin, 2024; Quan et al., 2023). The fact is that DT can also help SMEs rearrange its structural capital by automating their applications and creating more effective systems that can address the ever-changing needs of the business (Lu & Shaharudin, 2024; Methencheri & Sekhar, 2025). SMEs can develop dynamic capabilities that can use IC as a continuous way of improving and innovating performance through digital transformation (Cannas, 2023; Prakasa & Jumani, 2024; Sun et al., 2024). DT can help SMEs adjust to any external changes, become more innovative, and stay sustainable and competitive, by aligning with new technologies, which can strengthen IC components (Bhattacharyya & Jha, 2015; Dorhetso, 2025). The RBV and DCT theories highlight the synergy of IC and DT and how SMEs may utilize both to enhance competitiveness and to adapt consistent strategies to meet the challenges in the digital world.

Hypothesis Development

Human capital supports enhancing performance outcomes through induction of innovations and enhancement of decision making abilities. DT will also strengthen this relationship by improving information access and quality decision-making through the use of such technologies, thereby further increasing performance of SMEs (Chen & Wang, 2024; Dong et al., 2025; Li et al., 2024).

H1: Human Capital positively influences SME performance, and this relationship is strengthened by Digital Transformation (DT).

Structural capital will allow SMEs to operate efficiently and effectively. DT including automation and the integration of digital processes makes systems work better, and raise their competitiveness in the market. Integration of DT to structural capital has a positive effect on the performance of SMEs (Beltramino et al., 2020).

H2: Structural capital positively influences SME operational efficiency and market competitiveness and their relationship enhanced by Digital Transformation (DT).

Intense relational capital is the most important facet of expansion in the market and customer satisfaction. Through the digital platforms, SMEs have the opportunity of strengthening their customer relations, communicating better, and evolving constructive networks, thereby making relational capital much more effective in market performance (Agostini, Nosella, & Soranzo, 2017; Zahoor & Gerged, 2021; Zhang et al., 2025).

H3: Relational capital positively influences SME market expansion and customer satisfaction, and their relationship is strengthened by Digital Transformation (DT).

Digital transformation enables SMEs to optimize intellectual capital, boosting innovation, productivity, and performance by enhancing intellectual capital efficiency. (Ali et al., 2025; Lang et al., 2023; Le et al., 2024; Vo & Tran, 2024).

H4: Digital Transformation (DT) has a positive and significant moderating impact on Intellectual Capital and SMEs performance relationship.

METHODOLOGY

In Mulisa (2022), a logical, quantitative technique is used to quantify and interprets facts. This study used quantitative methods and a structured questionnaire method to test the theory-aligned hypothesis. The survey involved SMEs owners and managers of SMEs operating in Pakistan. The participants were given 350 questionnaires and 300 valid responses were gathered, yielding a response rate of about 85.7% (Bell et al., 2022; Fink, 2024).

The study design involves quantitative cross-sectional study to gather information at a given moment and enable the researcher to analyze variables in detail (Creswell & Creswell, 2014). The questionnaire had two major sections. In the first section, participants provided demographic data including industry type, size, age, revenue, and operating country. The second part was devoted to the key variables of the study, i.e. Intellectual Capital (IC), Digital Transformation (DT), and SMEs performance. The questionnaire contained a series of statements and the scale used to measure them was a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree (Likert, 1932). The descriptive statistics were performed on the data collected, using SPSS with the Structural Equation Modeling (SEM) performed using SmartPLS to determine the relationship between the variables.

Table 1 shows demographic characteristics comprises 300 SMEs drawn from a heterogeneous array of industrial sectors, organizational sizes, age profiles, income streams, and geographical origins. Nine industry categories such as Other, Retail, Manufacturing, Construction, Hospitality, Trade, Logistics, Professional Services, and Technology figure prominently, with Technology leading the distribution (24.33 %), followed by Manufacturing (22.33 %), Services (19.33 %), Retail (21.33 %) and Others (12.66 %). In terms of firm size, 23.33%, 48.33% and 28.33% have less than 10, 50 and below 250 employees respectively, therefore tracing a hall between micro and large business operations. Age distribution shows that 22 % of them have operated above 20 years, and 30 % have operated between 11-20 years. Revenue shows that 32.33% of companies earn more than Pakistan Rs 10 million annually, highlighting the dominance of high-revenue firms.

Table 1 Demographics Characteristics

Items	Frequency (N = 300)	Percentage (%)
Industry Type		
Technology	73	24.33%
Manufacturing	67	22.33%
Retail	64	21.33%
Services	58	19.33%
Other	38	12.66%
Size of the SME		
< 10 Employees	70	23.33 %
< 50 Employees	145	48.33 %
< 250 Employees	85	28.33%
Age of the Company		
Less than 5 years	71	23.67%
5-10 years	73	24.33%
11-20 years	90	30 %
Above 20 years	66	22 %
Annual Revenue		
Less than Rs1 million	65	21.67%
Rs1 million to Rs5 million	61	20.33%
Rs5 million to Rs10 million	77	25.67%
Above Rs10 million	97	32.33%

Common method bias

An examination of common method bias in this research used Harman's single-factor test, indicating variance below 50%, negating bias concerns (Podsakoff et al., 2003).

RESULTS

The statistical metrics in Table 2 display high item reliability for constructs measured with multiple items, with loadings predominantly surpassing 0.7. Cronbach's Alpha and Composite Reliability exceed 0.7 for all constructs, notably Human Capital (HC), Digital Transformation (DT), and SME Performance (SME) at 0.966, 0.953, and 0.968, respectively. The Average Variance Extracted (AVE) values also meet the benchmark, with values for HC, DT, and SME performance all exceeding 0.8, confirming good convergent validity. However, Relational Capital (RC) presents an issue, as the loading for RC1 and RC2 are negative, indicating potential problems with this construct's validity. Nevertheless, the overall analysis shows a strong reliability and validity for most constructs, which support model's strength (Hair, 2014).

Table 2. Results of Reliability & Validity

Construct	Items	Loading	Alpha	CR	AVE
Human Capital (HC)	HC1	0.936	0.966	0.973	0.879
	HC2	0.942			
	HC3	0.950			
	HC4	0.942			
	HC5	0.916			
Structural Capital (SC)	SC1	0.942	0.940	0.952	0.800
	SC2	0.900			
	SC3	0.885			
	SC4	0.870			
	SC5	0.874			
Relational Capital (RC)	RC1	-0.122	0.635	0.730	0.540
	RC2	-0.203			
	RC3	0.932			
	RC4	0.939			
	RC5	0.945			
Digital Transformation (DT)	DT1	0.933	0.953	0.963	0.838
	DT2	0.905			
	DT3	0.915			
	DT4	0.937			
	DT5	0.887			
SME Performance (SME)	SME1	0.929	0.968	0.975	0.885
	SME2	0.924			
	SME3	0.923			
	SME4	0.964			
	SME5	0.964			

Table 3 shows that the square root of each construct's AVE is higher than its respective correlation between constructs, which proves that the discriminant validity has been established. These results indicate that the constructs are well defined and they do not overly overlap excessively with each other, and therefore, fulfill the current standards of construct validity(Fornell & Larcker, 1981).

Table 3. Discriminant Validity (Fornell Larcker Criteria)

Construct	HC (Human Capital)	SC (Structural Capital)	RC (Relational Capital)	DT (Digital Transformation)	SME (SME Performance)
HC	0.937	0.682	0.560	0.671	0.839
SC	0.682	0.894	0.467	0.677	0.768
RC	0.560	0.467	0.734	0.531	0.705
DT	0.671	0.677	0.531	0.915	0.875
SME	0.839	0.768	0.705	0.875	0.938

Table 4 also states that none of the HTMT values exceed 0.85, the recommended value, indicating that the discriminant validity requirements are satisfied. These findings prove that the constructs are well disassociated from each other and reinforce that the total model meets the required standard of discriminant validity(Henseler et al., 2015).

Table 4. Discriminant Validity (HTMT Criteria)

Construct	HC (Human Capital)	SC (Structural Capital)	RC (Relational Capital)	DT (Digital Transformation)	SME (SME Performance)
HC		0.784	0.632	0.752	0.894
SC	0.784		0.578	0.774	0.872
RC	0.632	0.578		0.682	0.798
DT	0.752	0.774	0.682		0.936
SME	0.894	0.872	0.798	0.936	

Figure 2 illustrate the graphical representation of the Confirmatory Factor analysis (Measurement Model).

Figure 2: Measurement Model (Confirmatory Factor Analysis)

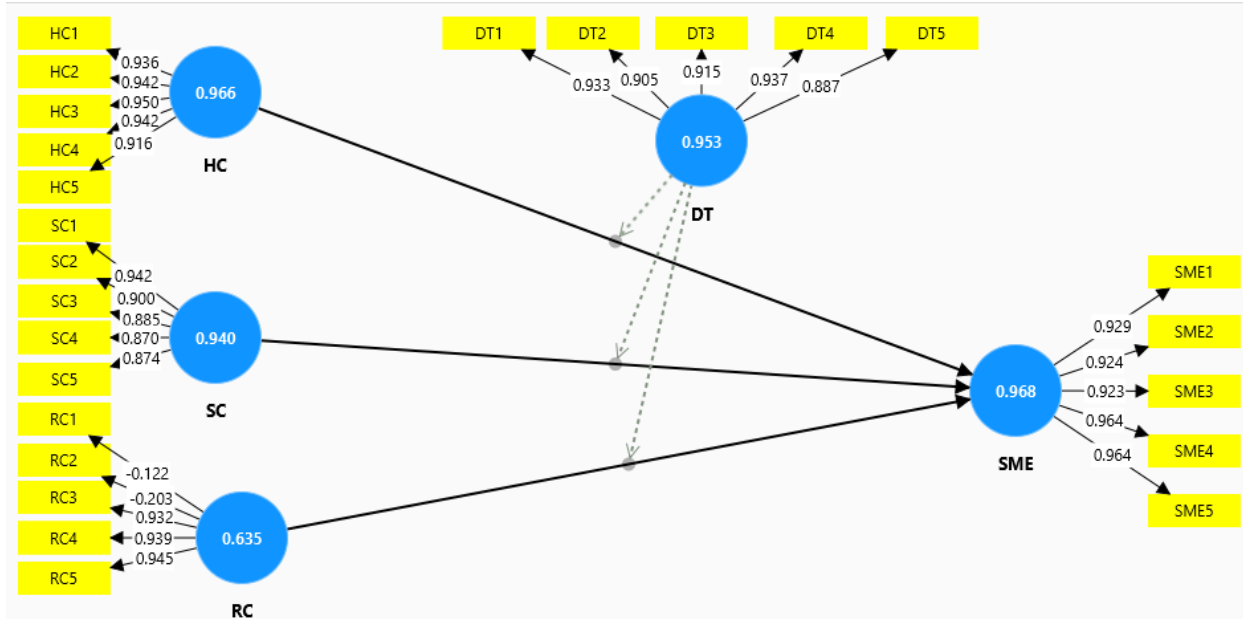


Table 5 explains the direct relationships among the significant elements of Intellectual Capital (IC) and the SMEs Performance. The first hypothesis (H1) reports that Human Capital (HC) has a positive impact on the SME Performance, which has a path coefficient of 0.50 and t-value of 5.60 was highly significant ($p = 0.000$). H2 shows that Structural Capital (SC) has a positive impact on SME Performance as well as it gives the path coefficient of 0.45 and t-value of 5.10 and a significant value of p-value of 0.000. H3 also indicates that the Relational Capital (RC) also positively improves the SME Performance with further showing a path coefficient of 0.48, t-value of 5.20, and p-value of 0.000; thereby justifying all hypotheses sufficient to show the improvement of Relational Capital (RC) upon SME Performance as to be statistically significant.

Table 5. Results of Structural Equation Modeling (SEM) (Direct Effect Hypothesis H1 TO H3)

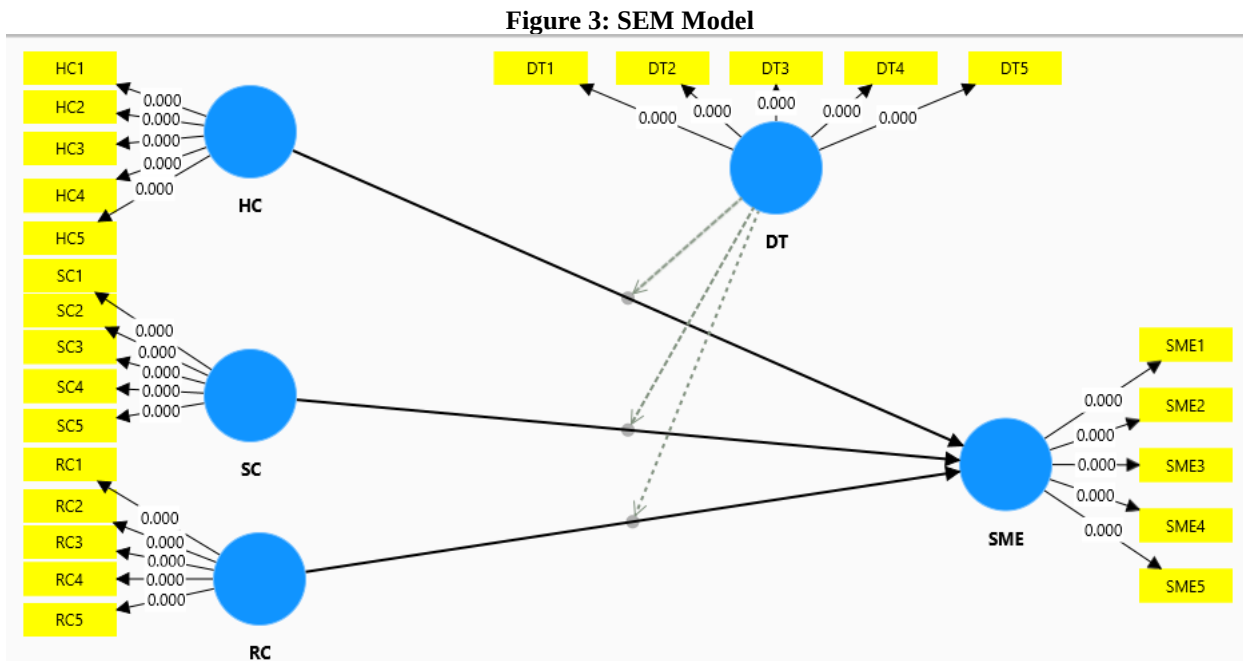
Hypothesis	Path	Path Coefficient	t-value	p-value
H1: Human Capital → SME Performance	HC → SME	0.50	5.60	0.000
H2: Structural Capital → SME Performance	SC → SME	0.45	5.10	0.000
H3: Relational Capital → SME Performance	RC → SME	0.48	5.20	0.000

Table 6 and figure-3 illustrates the Digital Transformation (DT) moderating role in the relationship between Intellectual Capital (HC, SC, RC) and SMEs performance. Human Capital (HC) exerts a positive influence on SME performance, and this effect is heightened when DT is present (path coefficient 0.40, $t = 4.85$, $p = 0.000$). A comparable pattern emerges for Structural Capital (SC) (path coefficient 0.35, $t = 4.10$, $p = 0.000$) and Relational Capital (RC) (path coefficient 0.42, $t = 4.50$, $p = 0.000$). The results as a whole imply that DT enhances the nexuses

existing between various types of intellectual capital and the performance of SMEs thus, supporting H4.

Table 6. Moderation Analysis (H4)

Hypothesis	Path	Path Coefficient	t-value	p-value
H5: DT moderates HC → SME Performance	HC*DT → SME	0.40	4.85	0.000
H5: DT moderates SC → SME Performance	SC*DT → SME	0.35	4.10	0.000
H5: DT moderates RC → SME Performance	RC*DT → SME	0.42	4.50	0.000



Source: Authors own work

DISCUSSION

The preliminary results of this investigation show a robust and direct linkage concerning IC and SMEs performance. Given the conceptual background, each component of IC, exhibits a positive and statistically significant association with SME outcomes (Jordão et al., 2020; Muda et al., 2020). In particular, employee knowledge, expertise, and skill, i.e., HC, become one of the brightest influencers of the innovation and labor productivity (Xu & Li, 2019). SMEs in which the highly skilled and innovative personnel stand out thus depict better performance trends (Al-Jinini et al., 2019). SC that consists of organizational procedures, systems and physical infrastructure further enhances efficiency of operational processes and competitiveness of the market (González-Loureiro & Dorrego, 2012; Khattak et al., 2024). Firms, that formalize strict measures and clear structures, are in a better position in the competitive platform. RC, which focuses its attention on the external ties in the network (customer loyalty, collaborative

partnerships, and brand reputation), also has a strong impact on the performance of SME (Aljuboory et al., 2021; Ashraf et al., 2023; Naushad & Faisal, 2023). The result enhances the need to have strong stakeholder relationships to achieve a long-term growth and competitiveness. At the same time, it allows more effective responding to the changes in the market and innovation speed (Beltramino et al., 2020). This knowledge is a confirmation of the idea that IC is a valuable resource in the SMEs environment; however, it can achieve the most significant potential, only in cooperation with the sphere of digital transformation (Sun et al., 2024; Teng et al., 2022; Westerman et al., 2014). The synergetic effect helps the SMEs boost the performance and guarantee the innovation and a sustainable development in the digital age (Motjolopane & Chanza, 2023). The results all contribute to the strategic need of SMEs to match intellectual capital and digital transformation as the way to achieve competitive differentiation and sustainability of long-term performance in a dynamic environment.

Study Limitations & Future Directions

The present investigation yields important insights into the ways Intellectual Capital (IC) and Digital Transformation (DT) shape SME performance; nonetheless, it is constrained by several limitations. First, the information is selected as a one-time cross-sectional outcome. This limits the ability to make conclusions about the causal relations through time. Second, the enterprise sample is a broad representative of the possible industries and geographic areas, yet, is unlikely to include the full variety of SME types, in particular, the ones located in underdeveloped or less digitalized sectors. Third, in the Relational Capital measurement, elements with negative loadings were found and such a possibility can be a threat to the validity of this construct. These obstacles are overcome in prospective studies that adopt the longitudinal research method because changes could be observed over time, could improve the sample size to include more industry-specific areas, and could advance the Relational Capital instrument.

Theoretical Contributions

First, the research prolongs the Resource-Based View (RBV) by signifying that the synergistic incorporation of human, structural, and relational capital enhances SME performance, particularly when digital transformation is involved. The current research, therefore, reveals that, though all of the IC components are beneficial in their singular forms, the combination of these approaches which is assisted by digital technologies results in the better outcomes. Second, the study introduces a new perspective on Dynamic Capabilities Theory (DCT): specifically, it emphasizes how digital transformation enhances SMEs performance. Third, the study contributes to the literature by addressing a gap in existing studies on the moderating role of digital transformation, an issue that has not received sufficient attention in the IC literature in SMEs. The interconnection of these theoretical lenses provides a comprehensive framework for envisioning how SMEs can use intangible assets and digital technologies to gain competitive advantage.

Managerial Implications

The study provides valuable understandings for managers seeking to boost organizational performance through strategic management of Intellectual Capital (IC) and digital transformation. It underscores the necessity for managers to cultivate people, structural, and relational capital to foster innovation and efficiency. This involves investing in employee skills, optimizing internal processes, and fostering beneficial external relationships. The research highlights the crucial role of digital transformation in enhancing IC outcomes, suggesting that SME leaders should prioritize leveraging advanced technologies such as AI, big data, and cloud

computing to maximize their intellectual assets. By combining effective IC management with digital transformation, SMEs can enhance decision-making, operational efficiency, and overall business agility, ensuring competitiveness and long-term success in the rapidly evolving digital economy.

CONCLUSION

The study underlines the main roles of Intellectual Capital (IC) and Digital Transformation (DT) in enhancing the performance of SMEs. Empirical evidence establishes that the composite of human, structural, and relational capital significantly influences SME performance, with digital transformation acting as a substantial moderator and enhancer of this influence. Aligning costly digital technologies with intellectual assets allows SMEs to streamline operations, foster innovation, and maintain competitiveness in dynamic business environments. Strategic integration of IC and DT through purposeful planning is essential for long-term growth and sustainable success. This research offers valuable insights for SMEs on leveraging intangible assets and digital capabilities to address contemporary economic challenges, benefiting both academic and entrepreneurial realms.

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REFERENCES

- Accenture, J. (2022). The art of AI maturity: Advancing from practice to performance. In.
- Agostini, L., Nosella, A., & Filippini, R. (2017). Does intellectual capital allow improving innovation performance? A quantitative analysis in the SME context. *Journal of intellectual capital*, 18(2), 400-418.
- Agostini, L., Nosella, A., & Soranzo, B. (2017). Measuring the impact of relational capital on customer performance in the SME B2B sector: the moderating role of absorptive capacity. *Business Process Management Journal*, 23(6), 1144-1166.
- Akhtar, F., Senadjki, A., & Vija Kumaran, V. (2025). Sustainability meets digital culture: the influence of ESG on financial performance in Malaysian manufacturing SMEs. *Journal of Innovative Digital Transformation*, 2(1), 90-108.
- Al-Jinini, D. K., Dahiyat, S. E., & Bontis, N. (2019). Intellectual capital, entrepreneurial orientation, and technical innovation in small and medium-sized enterprises. *Knowledge and Process Management*, 26(2), 69-85.
- Ali, I., Hassan, N. M., & Ramzan, M. S. (2025). The Moderating Role of Market Turbulence Between the Relationship of Digital Transformation, Intellectual Capital, and Economic Performance. *Policy Journal of Social Science Review*, 3(3), 247-263.

- Aljuboori, Z. M., Singh, H., Haddad, H., Al-Ramahi, N. M., & Ali, M. A. (2021). Intellectual capital and firm performance correlation: the mediation role of innovation capability in Malaysian manufacturing SMEs perspective. *Sustainability*, 14(1), 154.
- AlMujaini, H., Hilmi, M. F., Abudaqa, A., & Alzahmi, R. (2021). Corporate foresight organizational learning and performance: The moderating role of digital transformation and mediating role of innovativeness in SMEs. *International Journal of Data and Network Science*, 5(4), 703-712.
- Alvino, F., Di Vaio, A., Hassan, R., & Palladino, R. (2021). Intellectual capital and sustainable development: A systematic literature review. *Journal of intellectual capital*, 22(1), 76-94.
- Ashraf, S., Sadiq, M., Ferreira, P., & Almeida, A. M. (2023). Intellectual capital and a firm's sustainable performance and growth before and during the COVID-19 crisis: a comparative analysis of small and large European hospitality firms. *Sustainability*, 15(12), 9743.
- Awwad, M. S. (2025). Dynamic capabilities, intellectual capital and organisational performance: mediation and moderation effects. *Journal of intellectual capital*, 26(3), 738-760.
- Baimukhamedova, A., & Baimukhamedov, M. (2023). Digital transformation of small and medium businesses. In *Advancing SMEs Toward E-Commerce Policies for Sustainability* (pp. 19-43). IGI Global Scientific Publishing.
- Bansal, S., Garg, I., Jain, M., & Yadav, A. (2023). Improving the performance/competency of small and medium enterprises through intellectual capital. *Journal of intellectual capital*, 24(3), 830-853.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Bell, E., Harley, B., & Bryman, A. (2022). *Business research methods*. Oxford university press.
- Beltramino, N. S., García-Perez-de-Lema, D., & Valdez-Juárez, L. E. (2020). The structural capital, the innovation and the performance of the industrial SMES. *Journal of intellectual capital*, 21(6), 913-945.
- Bhattacharyya, S. S., & Jha, S. (2015). Mapping micro small and medium enterprises from the resource-based view and dynamic capability theory perspectives and innovation classification. *International Journal of Entrepreneurship and Small Business*, 25(3), 331-350.
- Bhuiyan, M. R. I., Faraji, M. R., Rashid, M., Bhuyan, M., Hossain, R., & Ghose, P. (2024). Digital transformation in SMEs emerging technological tools and technologies for enhancing the SME's strategies and outcomes. *Journal of Ecohumanism*, 3(4), 211-224.
- Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, 36(2), 63-76.
- Cabrilo, S., & Dahms, S. (2018). How strategic knowledge management drives intellectual capital to superior innovation and market performance. *Journal of Knowledge Management*, 22(3), 621-648.
- Cannas, R. (2023). Exploring digital transformation and dynamic capabilities in agrifood SMEs. *Journal of Small Business Management*, 61(4), 1611-1637.
- Cen, T., & Lin, S. (2025). Digital Transformation and Corporate Innovation in SMEs. *Systems*, 13(7), 551.
- Chen, D., & Wang, S. (2024). Digital transformation, innovation capabilities, and servitization as drivers of ESG performance in manufacturing SMEs. *Scientific reports*, 14(1), 24516.

- Chinomona, R. (2013). Business owner's expertise, employee skills training and business performance: A small business perspective. *Journal of Applied Business Research*, 29(6), 1883.
- Cleary, P. (2015). An empirical investigation of the impact of management accounting on structural capital and business performance. *Journal of intellectual capital*, 16(3), 566-586.
- Creswell, J. W., & Creswell, J. D. (2014). *Research desing: qualitative, quantitative and mixed methods approaches* (Vol. 54). United State of America: Sage Publications.
- Daou, A., Karuranga, E., & Su, Z. (2013). Intellectual capital in Mexican SMEs from the perspective of the resource-based and dynamic capabilities views. *Journal of Applied Business Research*, 29(6), 1673.
- De Luca, F., Cardoni, A., Phan, H.-T.-P., & Kiseleva, E. (2020). Does structural capital affect SDGs risk-related disclosure quality? An empirical investigation of Italian large listed companies. *Sustainability*, 12(5), 1776.
- Demartini, M. C., & Beretta, V. (2020). Intellectual capital and SMEs' performance: A structured literature review. *Journal of Small Business Management*, 58(2), 288-332.
- Demartini, M. C., & Beretta, V. (2022). Intellectual capital in SMEs: a review and research agenda. *International Journal of Learning and Intellectual Capital*, 19(1), 5-29.
- Dong, Z., Abd Aziz, M. F., & Wang, Y. (2025). An Empirical Analysis of How Artificial Intelligence Development Influences the Adjustment of Human Capital Structure in Businesses. *Finance Research Letters*, 107827.
- Dorhetso, S. (2025). Digital Technologies and Stakeholders' Engagement in SMEs. *Available at SSRN 5277700*.
- Dumay, J., & Garanina, T. (2013). Intellectual capital research: a critical examination of the third stage. *Journal of intellectual capital*, 14(1), 10-25.
- Edvinsson, L., & Malone, M. S. (1997). Intellectual capital: Realizing your company's true value by finding its hidden roots. (*No Title*).
- Elsa, D., Indrawati, H., & Caska, C. (2025). Digital transformation in SMEs: global maps and trends of research. *Strategy & Leadership*, 53(2), 132-159.
- FAISAL, R., AMEKUDZI, C. S., KAMRAN, S., FONKEM, B., TAWO, O., & AWOFADEJU, M. (2023). The Impact of Digital Transformation on Small and Medium Enterprises (SMEs) in the USA: Opportunities and Challenges.
- Fedderke, J. W. (2005). *Technology, human capital and growth*.
- Fink, A. (2024). *How to conduct surveys: A step-by-step guide*. SAGE publications.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Garzoni, A., De Turi, I., Secundo, G., & Del Vecchio, P. (2020). Fostering digital transformation of SMEs: a four levels approach. *Management Decision*, 58(8), 1543-1562.
- González-Loureiro, M., & Dorrego, P. F. (2012). Intellectual capital and system of innovation: What really matters at innovative SMEs. *Intangible capital*, 8(2), 239-274.

- Guerrero, S., Cayrat, C., & Cossette, M. (2022). Human resource professionals' human and social capital in SMEs: small firm, big impact. *The International Journal of human resource management*, 33(16), 3252-3274.
- Hair, J. F. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*. sage.
- Hayton, J. C. (2003). Strategic human capital management in SMEs: An empirical study of entrepreneurial performance. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, 42(4), 375-391.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43(1), 115-135.
- Islam, S., Hossain, E., Rahman, M. S., Rahman, M. M., Khan, S. I., & Ashik, A. A. M. (2023). Digital Transformation in SMEs: Unlocking Competitive Advantage through Business Intelligence and Data Analytics Adoption. *Journal of Business and Management Studies*, 5(6), 177-186.
- Iyelolu, T. V., Agu, E. E., Idemudia, C., & Ijomah, T. I. (2024). Driving SME innovation with AI solutions: overcoming adoption barriers and future growth opportunities. *International Journal of Science and Technology Research Archive*, 7(1), 036-054.
- Jeza, S., & Lekhanya, L. M. (2022, September 9). The influence of digital transformation on the growth of small and medium enterprises in South Africa. *Business Perspectives*, 20(3), 297-309. [https://doi.org/10.21511/ppm.20\(3\).2022.24](https://doi.org/10.21511/ppm.20(3).2022.24)
- Jain, P., Vyas, V., & Roy, A. (2017). Exploring the mediating role of intellectual capital and competitive advantage on the relation between CSR and financial performance in SMEs. *Social Responsibility Journal*, 13(1), 1-23.
- Jevtic, B., Zakic, N., Popovic, J., Coric, G., & Kvrjic, G. (2020). Digital Challenges for SMES Organisations in Human Capital Investments and Change. *Economic and Social Development: Book of Proceedings*, 20-29.
- Jordão, R. V. D., Novas, J., & Gupta, V. (2020). The role of knowledge-based networks in the intellectual capital and organizational performance of small and medium-sized enterprises. *Kybernetes*, 49(1), 116-140.
- Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). Strategy, not technology, drives digital transformation. *MIT Sloan management review*.
- KATSINIS, A. A., LAGÜERA, G. J., DI, B. L., ODENTHAL, L., HELL, M., & LOZAR, B. (2024). Annual Report on European SMEs 2023/2024, SME performance review.
- Khalique, M., Hina, K., Ramayah, T., & Shaari, J. A. N. b. (2020). Intellectual capital in tourism SMEs in Azad Jammu and Kashmir, Pakistan. *Journal of intellectual capital*, 21(3), 333-355.
- Khattak, M. S., Wu, Q., Ahmad, M., & Anwar, M. (2024). Probing the impact of intellectual capital on SME efficiency: the role of business model innovation. *Journal of intellectual capital*, 25(2/3), 613-639.
- Kim, S., & Ha, T. (2023). Influential variables and causal relations impact on innovative performance and sustainable growth of SMEs in aspect of industry 4.0 and digital transformation. *Sustainability*, 15(9), 7310.

- Kim, S. Y., & Tran, D. B. (2024). Intellectual capital and performance: evidence from SMEs in Vietnam. *Asia-Pacific Journal of Business Administration*, 16(4), 860-875.
- Koumas, M., Dossou, P.-E., & Didier, J.-Y. (2021). Digital transformation of small and medium sized enterprises production manufacturing. *Journal of Software Engineering and Applications*, 14(12), 607-630.
- Kraaijenbrink, J., Spender, J.-C., & Groen, A. J. (2010). The resource-based view: A review and assessment of its critiques. *Journal of management*, 36(1), 349-372.
- Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International journal of information management*, 63, 102466.
- Kumcu, E. H., Sharma, R., & Singh, M. (2025). The Impact of Intellectual Capital and Emotional Intelligence on Firm Performance of SMEs: The Mediating Role of Deep Fake Technology. In *Navigating the Deepfake Conundrum: A Manager's Roadmap* (pp. 195-206). Cham: Springer Nature Switzerland. https://link.springer.com/chapter/10.1007/978-3-031-90742-5_14
- Lang, L. D., Behl, A., Phuong, N. N. D., Gaur, J., & Dzung, N. T. (2023). Toward SME digital transformation in the supply chain context: the role of structural social and human capital. *International Journal of Physical Distribution & Logistics Management*, 53(4), 448-466.
- Le, T. T., Quan Chau, T. L., Vo Nhu, Q. P., & Ferreira, J. J. (2024). Digital platforms and SMEs' performance: the moderating effect of intellectual capital and environmental dynamism. *Management Decision*, 62(10), 3155-3180.
- Li, Y., Li, J., & Zhai, Y. (2024). Intellectual capital and sustainability performance: the mediating role of digitalization. *Journal of intellectual capital*, 25(5/6), 867-890.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology*.
- Lu, H., & Shaharudin, M. S. (2024). Role of digital transformation for sustainable competitive advantage of SMEs: a systematic literature review. *Cogent Business & Management*, 11(1), 2419489.
- Lu, Q., Yan, R., Yang, Y., & Yang, X. (2024). Supply chain specific investments and enterprise performance of SMEs: a resource orchestration perspective. *IEEE Transactions on Engineering Management*, 71, 5487-5505.
- Mai, B. T., Nguyen, P. V., Ton, U. N. H., & Ahmed, Z. U. (2024). Government policy, IT capabilities, digital transformation, and innovativeness in Post-Covid context: case of Vietnamese SMEs. *International Journal of Organizational Analysis*, 32(2), 333-356.
- Markevičius, V. (2025). *Small and medium enterprises (smes) growth: the role of digital transformation and open innovation* Vilniaus universitetas.].
- Martínez-Peláez, R., Ochoa-Brust, A., Rivera, S., Félix, V. G., Ostos, R., Brito, H., Félix, R. A., & Mena, L. J. (2023). Role of digital transformation for achieving sustainability: mediated role of stakeholders, key capabilities, and technology. *Sustainability*, 15(14), 11221.
- McAfee, A., & Brynjolfsson, E. (2017). *Machine, platform, crowd: Harnessing our digital future*. WW Norton & Company.
- Mertins, K., Alwert, K., & Will, M. (2006). Measuring intellectual capital in European SME. Proceedings of I-Know,

- Methencheri, R., & Sekhar, R. (2025). Managing growth in Indian information technology-based small and medium-sized enterprises: An exploratory study of product portfolios, technology infrastructure, and platform thinking. In.
- Motjolopane, I., & Chanza, M. (2023). Digital transformation dimensions for evaluating SMEs' readiness for big data analytics and artificial intelligence: A review. *International Journal of Research in Business & Social Science*, 12(7).
- Muda, S., Rahman, M. R. C. A., Hamzah, N., & Saleh, N. M. (2020). Intellectual capital and SMEs' business performance from an organisational lifecycle perspective. *The South East Asian Journal of Management*, 14(1), 5.
- Mulisa, F. (2022). When does a researcher choose a quantitative, qualitative, or mixed research approach?. *Interchange*, 53(1), 113-131.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of management review*, 23(2), 242-266.
- Naushad, M., & Faisal, S. (2023). Intellectual capital efficiencies and performance of SMEs in KSA. *International Journal of Applied Management Science*, 15(2), 151-165.
- Ngugi, J. K. (2014). Influence of intellectual capital on the growth of small and medium enterprises in Kenya.
- Nguyen, T.-N.-L., & Le, S.-T. (2025). Factors Leading to the Digital Transformation Dead Zone in Shipping SMEs: A Dynamic Capability Theory Perspective. *Sustainability*, 17(12), 5553.
- Nguyen Van, I., Le, T. T., & Kotaskova, A. (2023). The role of brand and market orientation on competitive advantage in the food sector: business strategy's moderator role. *British Food Journal*, 125(11), 3888-3911.
- Obeidat, U., Obeidat, B., Alrowwad, A., Alshurideh, M., Masadeh, R., & Abuhashesh, M. (2021). The effect of intellectual capital on competitive advantage: The mediating role of innovation. *Management Science Letters*, 11(4), 1331-1344.
- Oliveira, M., Curado, C., Balle, A. R., & Kianto, A. (2020). Knowledge sharing, intellectual capital and organizational results in SMES: are they related? *Journal of intellectual capital*, 21(6), 893-911.
- Omrani, N., Rejeb, N., Maalaoui, A., Dabić, M., & Kraus, S. (2022). Drivers of digital transformation in SMEs. *IEEE Transactions on Engineering Management*, 71, 5030-5043.
- Philbin, S., Viswanathan, R., & Telukdarie, A. (2022). Understanding how digital transformation can enable SMEs to achieve sustainable development: A systematic literature review. *Small Business International Review*, 6(1), e473.
- Plekhanov, D., Franke, H., & Netland, T. H. (2023). Digital transformation: A review and research agenda. *European Management Journal*, 41(6), 821-844.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.
- Prakasa, Y., & Jumani, Z. A. (2024). Linking digital capability to small business performance: the mediating role of digital business transformation. *Cogent Business & Management*, 11(1), 2342486.

- Prasanna, R., Jayasundara, J., Naradda Gamage, S. K., Ekanayake, E., Rajapakshe, P., & Abeyrathne, G. (2019). Sustainability of SMEs in the competition: A systemic review on technological challenges and SME performance. *Journal of open innovation: technology, market, and complexity*, 5(4), 100.
- Quan, H., Li, S., Zeng, C., Wei, H., & Hu, J. (2023). Big data and AI-driven product design: a survey. *Applied Sciences*, 13(16), 9433.
- Rehman, S. U., Bresciani, S., Ashfaq, K., & Alam, G. M. (2022). Intellectual capital, knowledge management and competitive advantage: a resource orchestration perspective. *Journal of Knowledge Management*, 26(7), 1705-1731.
- Raihan, A., Pereira, J. J., Begum, R. A., & Rasiah, R. (2023a). The economic impact of water supply disruption from the Selangor River, Malaysia. *Blue-Green Systems*, 5(2), 102-120.
- Sardo, F., & Serrasqueiro, Z. (2019). On the relationship between intellectual capital and service SME survival and growth: A dynamic panel data analysis. *International Journal of Learning and Intellectual Capital*, 16(3), 213-238.
- Shahbaz, M. H., Ahmad, S., & Malik, S. A. (2025). Green intellectual capital heading towards green innovation and environmental performance: assessing the moderating effect of green creativity in SMEs of Pakistan. *International Journal of Innovation Science*, 17(3), 683-704.
- Shahbaz, M. H., & Malik, S. A. (2025). Driving firm performance with green intellectual capital: the key role of business sustainability in SMEs. *Journal of intellectual capital*, 26(3), 691-715.
- Sohel Rana, M., & Hossain, S. Z. (2023). Intellectual capital, firm performance, and sustainable growth: A study on DSE-listed nonfinancial companies in Bangladesh. *Sustainability*, 15(9), 7206.
- Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management journal*, 48(3), 450-463.
- Sun, Z., Hu, D., & Lou, X. (2024). The Impact of Digital Transformation on the Sustainable Growth of Specialized, Refined, Differentiated, and Innovative Enterprises: Based on the Perspective of Dynamic Capability Theory. *Sustainability*, 16(17), 7823.
- Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, 28(13), 1319-1350.
- Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of management perspectives*, 28(4), 328-352.
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47(8), 1367-1387.
- Teng, X., Wu, Z., & Yang, F. (2022). Research on the relationship between digital transformation and performance of SMEs. *Sustainability*, 14(10), 6012.
- Thatrak, D. (2021). Human capital orientation, employee creativity development, organizational innovation capabilities, and outstanding performance of SMEs businesses in Thailand. *International Journal of Economics and Business Administration*, 9(2), 126-142.
- The Digital Transformation of SMEs. (2021, January 30). Organization for Economic Cooperation and Development. <https://doi.org/10.1787/bdb9256a-en>

- Urban, B., & Joubert, G. (2017). Drivers of intellectual capital and organisational performance: a focus on human capital, structural capital and relational capital. *Journal of Contemporary Management*, 14(1), 1243-1272.
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing digital transformation*, 13-66.
- Vo, D. H., & Tran, N. P. (2024). Does digital transformation moderate the effect of intellectual capital on firm performance? *Journal of the Knowledge Economy*, 1-23.
- Voca, Z., & Havolli, Y. (2019). The impact of human resources development on small and medium enterprises (SMEs) performance. *Journal of Economics and Management Sciences*, 2(2), p45-p45.
- Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading digital: Turning technology into business transformation*. Harvard Business Press.
- Xu, J., & Li, J. (2019). The impact of intellectual capital on SMEs' performance in China: Empirical evidence from non-high-tech vs. high-tech SMEs. *Journal of intellectual capital*, 20(4), 488-509.
- Yang, Y., & Gong, X. (2025). HARNESSING INTELLECTUAL CAPITAL FOR INNOVATION: THE MODERATING EFFECT OF DIGITAL TRANSFORMATION IN MANUFACTURING INDUSTRIES. *World Journal of Economics and Business Research*, 25.
- Zahoor, N., & Gerged, A. M. (2021). Relational capital, environmental knowledge integration, and environmental performance of small and medium enterprises in emerging markets. *Business Strategy and the Environment*, 30(8), 3789-3803.
- Zhang, X., Xu, Y., & Ma, L. (2022). Research on successful factors and influencing mechanism of the digital transformation in SMEs. *Sustainability*, 14(5), 2549.
- Zhang, Y., Li, H., & Yao, Z. (2025). Intellectual capital, digital transformation and firm performance: evidence based on listed companies in the Chinese construction industry. *Engineering, Construction and Architectural Management*, 32(4), 2128-2159.