



Digital Transformation, Entrepreneur Digital Literacy and Business Performance: Empirical Evidence from Small Trading Enterprises in Sri Lanka

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Abstract

Digital transformation is a vital strategic tool for small businesses in today's technology-driven competitive markets. Despite considerable evidence of a positive link between digital transformation and business performance, conclusive evidence is lacking in the context of emerging economies, specifically regarding the moderating role of the entrepreneur's digital literacy. This paper fills this gap by investigating how the business performance of Sri Lankan small trading enterprises is influenced by digital transformation in terms of digital infrastructure, processes, skills, and strategies, while exploring the moderating role of entrepreneurs' digital literacy. Data were collected using a structured questionnaire from a sample of small trading enterprises operating in the Matale District of Sri Lanka. A quantitative, cross-sectional methodological framework has been used in this investigation, which tests hypotheses using multiple regression and moderation analysis via the PROCESS macro. The results show that the dimensions of digital transformation positively influence business performance. Interestingly, entrepreneurial digital literacy was found to be a significant moderator, with a negative interaction term, implying diminishing marginal returns for business performance associated with digital transformation at higher levels of digital literacy. Hence, evidence confirms that digital transformation is effective in improving the performance outcomes of small enterprises; however, it should be adapted to the digital skills possessed by their entrepreneurs.

Key words: Digital transformation, business performance, digital literacy, small enterprises

Introduction

The Small and Medium Enterprise (SME) sector has been identified as a strategically significant sector in the Government of Sri Lanka's economic policy objectives. It is considered a change-maker for wide-ranging economic growth, regional development, employment generation, and poverty alleviation. The SME sector is envisaged to contribute to transforming lagging regions into emerging regions of prosperity. The Government of Sri Lanka identifies SMEs as the backbone of the economy, as they represent over 75% of the total enterprises in the economy, offer 45% of the employment and contribute to 52% of the Gross Domestic Product (GDP) of the country (Ministry of Industry & Commerce, 2016). SMEs promote broad-based, equitable development and provide more opportunities for women and youth participation in the country's economic development.

The SME Policy Framework aims to promote high-potential, promising SMEs and improve the business environment to allow them to realize their full potential in today's globalized economy. Given the nature of this sector, SMEs face many challenges. It has been recognized that appropriate digital information is important for the successful management of any business entity, whether large or small. (Madurapperuma et al, 2016).

Digital transformation refers to the profound and accelerating transformation of business activities, processes, competencies, and models to fully leverage the opportunities and changes enabled by digital technologies and their strategic impact (Becker & Schmid, 2020). The digital transformation significantly changes the operations of organisations worldwide, thereby pushing small and medium-sized enterprises (SMEs) to change their strategies to achieve competitive advantage (Jeza & Lekhanya, 2022). The way these technological initiatives have affected the performance of different sectors needs an in-depth examination, especially in countries like Sri Lanka (Rasool & Dissanayake, 2019). The significant benefits of these adoptions have been further highlighted by the effective use of digital technologies (Lokuge & Duan, 2023). Such advantages include efficiency gains, increased market access, and optimized decision-making, thereby strengthening organisations with greater resilience (Browder et al., 2024).

The process of digital transformation requires aligning digital technologies across business functions, thereby enabling a paradigm shift in operations and value-creation processes (Kahre et al., 2017). Digital transformation is not only the adoption of different technologies, but also a broad organizational transformation that leverages digital technologies to develop, transform, or innovate

business processes, paradigms, or customer experiences (Kyurova, 2022). Analysis of the business model is of utmost importance for SMEs, as they generally operate under resource constraints and face stiff competition. Hence, the adoption of digital technologies can act as a strategic differentiator that determines success or failure in the future (Haohan & Beinan, 2023). The need for the strategic adoption of digital technologies is also amplified by their potential to promote inclusive development by mitigating inequalities, thereby ensuring development (Díaz et al., 2024). It is imperative for SMEs to ensure viability in the rapidly changing digital economy, making strategic adoption a necessity (Lokuge & Duan, 2023).

In countries like Sri Lanka, there is immense scope for digital transformation to improve efficiency, accelerate business expansion, and promote innovation in SMEs (Dissanayake & Weerakoon, 2021). However, despite its immense scope, there are several hindrances to effective digital transformation for SMEs in countries like Sri Lanka, especially in rural areas such as Matale (Mahlaule et al., 2024). Some important inhibitors identified in empirical studies for SMEs seeking to transform digitally include resource limitations, lack of awareness of digital technology, and resistance to change (Ifeoluwa et al., 2021). According to the Resource-Based View Theory, for a digital transformation to be successful, resource procurement, such as digital awareness, is paramount (Barney, 1991). However, according to Technology-Organization-Environment Theory, for a digital transformation to be successfully implemented, factors such as infrastructure are important (Tornatzky & Fleischer, 1990). Evidence from the Sri Lankan environment has demonstrated a gap in the use of digital technology, specifically in the digital engagement of rural SMEs, which is lower than that of urban businesses (Rasool & Dissanayake, 2019). For instance, SMEs in the rural areas of any given district, including Matale, lack sufficient support infrastructure and the competencies necessary for optimal use of digital technology; therefore, digital strategies cannot be implemented (Gamage & Halpin, 2007). On another note, digital literacy, i.e., the capability to search for, interpret, and use digital information, is highlighted as one of the salient features required in the digital transformation process (OECD, 2019). A lack of literacy can result in the ineffective exploitation of potential technologies; therefore, their full benefits cannot be fully reaped (MV et al., 2024). Even though digitization and the adoption of technologies have been subjects of extensive research, significant knowledge gaps remain in the existing literature regarding the applicability of such models from the perspective of SMEs in developing nations (Díaz et al., 2024). This research responds to this knowledge gap, aiming to present empirical findings on the particular combination of digital

transformation, the importance of digital literacy, and the performance of small businesses in Matale District. The research aims to identify the critical success factors and potential inhibitors to the adoption of digital technologies, thereby shedding useful light on how policymakers and small business owners can practically apply the findings. Hence, the study aims to examine the impact of digital transformation on the business performance of the trading sectors of small enterprises in Matale district, Sri Lanka, across varying levels of small entrepreneurs' digital literacy. The research offers novel, district-level empirical findings on the combined impact of digital transformation and digital literacy on the performance of Matale small businesses.

More specifically, our study first explores the extent to which the trading sector of small enterprises in Matale District is digitally transformed, and second, the impact that each dimension of digital transformation has on business performance of trading sector and finally, the role of digital literacy among entrepreneurs in Matale district in moderating the effects of digital transformation on business performance of small enterprises.

Review of literature

Digital transformation is an emerging trend that has dominated current studies of SMEs, with small firms using digital technology to improve their competitiveness, efficiency, and agility. An important theoretical framework for understanding the role of digital transformation in improving firm performance is that of technology adoption.

The Technology Acceptance Model (TAM) is one of the widely accepted models that explain the adoption of technology at both the individual and organisational levels. TAM suggests that perceptions of usefulness and ease of use influence the individual's attitude and behaviours conducive to technology adoption. Although it is designed for individual-level research, it has found numerous applications in studying the adoption of digital technologies among SMEs, including electronic commerce platforms, enterprise systems, and cloud-based applications. Evidence suggests that if SME owners perceive that digital technology enhances the efficiency of their businesses and offers relative ease of implementation, adoption is a strong possibility. Variants of TAM, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), strongly emphasise social factors, including support factors, as critical determinants of digital technology adoption, which are more relevant for SMEs that make adoption decisions at the same point of authority. Venkatesh et al. (2003) propose that subjective

norms significantly influence this adoption, particularly in the context of SMEs operating on limited budgets.

Supplementing TAM, the Theory of Diffusion of Innovation (DOI) provides a more encompassing, process-based perspective on the diffusion of digital technology within and among organisations. DOI views adoption as dependent on inherent qualities of innovation: relative advantage, complexity, trialability, or observability, as well as adopter profiles segmented by their degree of pragmatism concerning innovation adoption. The framework developed by Rogers (2003) has gained widespread use in digitalisation studies of SMEs, indicating the critical positive roles of performance enhancement, business practice match, and degree of implementation complexity in the adoption of digital technology among SMEs. On the other hand, the risk of application, lack of technological competence, or uncertain returns tend to hinder the diffusion of digital technologies among the last-adopting organisations. When taken together, both models provide complementary information: TAM explains who adopts or rejects technology, whereas DOI explains what happens over time to adopted technology.

Although adoption-theory-based models do explain initial adoption, they do not adequately address the role of digital transformation in improving SME performance. This is where the Resource-Based View (RBV) of the firm helps by identifying the strategic significance of a firm's specific resources and competencies. RBV proposes that firms gain a competitive advantage by owning valuable, rare resources which are difficult to imitate. In this regard, it is likely that digital transformation, by itself, does not help firms improve their performance, but, when combined with complementary assets, it does make a difference. This is supported by initial evidence in the literature from Bharadwaj (2000), who found that information technology capability, not investment, is a source of sustainable competitive advantage in some firms. More recent evidence also suggests that digital transformation-based assets, such as e-commerce competence, data analytics competence, or digital customer interfaces, positively influence firm performance when firm strategies are properly aligned with these assets (Karungani and Ochiri, 2017).

However, as a static theory, the Resource-Based View (RBV) has limitations when applied to dynamic digital settings like the digital ecosystem, which is constantly changing. This reiterates the increased relevance of dynamic capabilities. According to Teece (2007), dynamic capabilities take precedence in dynamic settings, especially in environments characterised by technological turbulence.

In the SME setting, dynamic capabilities enable adequate adjustments to the dynamic digital ecosystem, thereby helping develop digital assets, business models, or routines in response to technology turbulence. Moreover, emerging literature suggests that dynamic capabilities can help companies leverage digital transformation to the fullest, given their increased adaptability and capacity to better address its challenges.

The Human Capital Theory further extends the existing paradigm by underscoring the significance of skills and knowledge in driving productivity. In this context, the results following digital transformation are highly dependent on the digital literacy of entrepreneurs and workers. Digital literacy refers to the ability to understand and make effective use of digital technologies. This skill and ability have been found crucial to ensuring the success that follows digital transformation. The existing literature indicates that advanced digital skill sets make the effective use of digital technologies easier to implement and thus more likely to yield the beneficial outcomes enabled by digitalization. For example, Van Laar et al. (2017) highlight the importance of digital skills for effective technology use. On the other hand, the OECD (2019) highlights the significance of digital literacy in driving product and competitive outcomes among small firms.

There is robust empirical evidence supporting the importance of digitization as an enabler for small and medium-scale organisations. The literature suggests that digitization has increased the efficiency of business operations and supported innovation in organisations. According to Tariq (2025), digitization has enabled small and medium-scale organisations to overcome the disadvantages caused by size differences by leveraging larger markets and innovative value creation. For instance, Vrontis et al. (2022) demonstrated that organisations with comprehensive digitization infrastructure are highly adaptable and nimble. This has further contributed to the financial and non-financial success of organisations. It can thus be inferred that digitization has an important enabling role.

In the operational environment, integrating digital technology enhances SMEs' effectiveness in customer engagement and data-driven decision-making. Chiang et al. (2020) emphasised that digital technology enables SMEs to interact with customers and implement customised marketing strategies, thereby enabling faster customer acquisition and improved customer retention. Furthermore, the smooth functionality of digital technology, as measured by Zheng et al. (2024), results in significantly improved productivity and significantly reduced operational expenditures. This factor alone ensures improved firm performance. Innovation outputs are given primary weight in discussions of digital

transformations among SMEs. Sussan and Acs (2017) argued that digital technology enables SMEs to access worldwide knowledge networks, thereby ensuring the creation of novel goods and services. The study by Khin and Hung Kee (2022) found that digital transformation significantly impacts the innovative capacity of SMEs by enabling collaboration, experimentation, and knowledge sharing. In the SME environment, where competition and unpredictability are common, improved firm performance resulting from innovation-based differentiation assumes its rightful prominence.

Despite these positive results, digital transformation is not automatically associated with improved performance, underscoring the moderating role of digital literacy. The empirical evidence highlights that the digital skills of SME owners and employees play a pivotal role in the efficient use of digital technology. According to Neumeyer et al. (2020), a lack of digital literacy is one of the most significant barriers to effective use of digital technology, thus hindering improved performance outcomes. According to Ibrahim and Aduah (2025), digital literacy among SME owners enhances their ability to adopt data analysis technologies, enabling them to make better decisions and achieve optimal levels of business efficiency. Digital literacy plays a pivotal role in building a culture and attitudes towards digital transformation. According to Lahumuddin (2025), digital literacy can reduce resistance to digital transformation by increasing self-confidence and a sense of control among SME owners and employees, thereby fostering a positive culture of innovation and digital transformation within SMEs. Chen et al. (2016) argue that digital literacy can help SMEs overcome resource scarcity by efficiently using cloud computing, social networking, and e-commerce platforms, thereby improving market accessibility and flexibility.

In conclusion, drawing on the literature, it is evident that SMEs' performance in gaining from digital transformation depends on several complex factors that interface with technology adoption and human capital. Although TAM and DOI models clarify digital technology adoption behaviours, RBV and DCV clarify their application for deriving competitiveness through digital resources, whereas Human Capital Theory draws attention to digital literacy as an important catalyst that multiplies the performance benefits of digital transformation for SMEs. Nonetheless, current research challenges appear to focus mostly on country-level or cross-country research, with little emphasis on district-level research. This clearly underscores the importance of localised research to clarify the joint effects of digital transformation and digital literacy on SME performance.

Methodology

This study aims to examine the impact of digital transformation on the business performance of trading sectors of small enterprises in Matale district, Sri Lanka, across varying levels of small entrepreneurs' digital literacy.

Conceptual framework and hypotheses

Based on the current literature on digital transformation and firm performance, this study proposes digital transformation as a multidimensional construct encompassing digital infrastructure transformation, digital process transformation, digital skills transformation, and digital strategy transformation to ensure that both technological and process-related aspects of digital transformation are established. This is evident since digital infrastructure supports operational networks, digital processes enable efficiency, digital skills empower positive technology adoption, and digital strategy aligns with entrepreneurial objectives (Bharadwaj, 2000; Teece, 2007; Vrontis et al., 2022). Business performance is established as the dependent variable, while digital literacy of entrepreneurs is employed as the moderator since it is imperative for ensuring that digital transformation is linked with positive performance outcomes of businesses (van Laar et al., 2017; Ibrahim and Aduah, 2025).

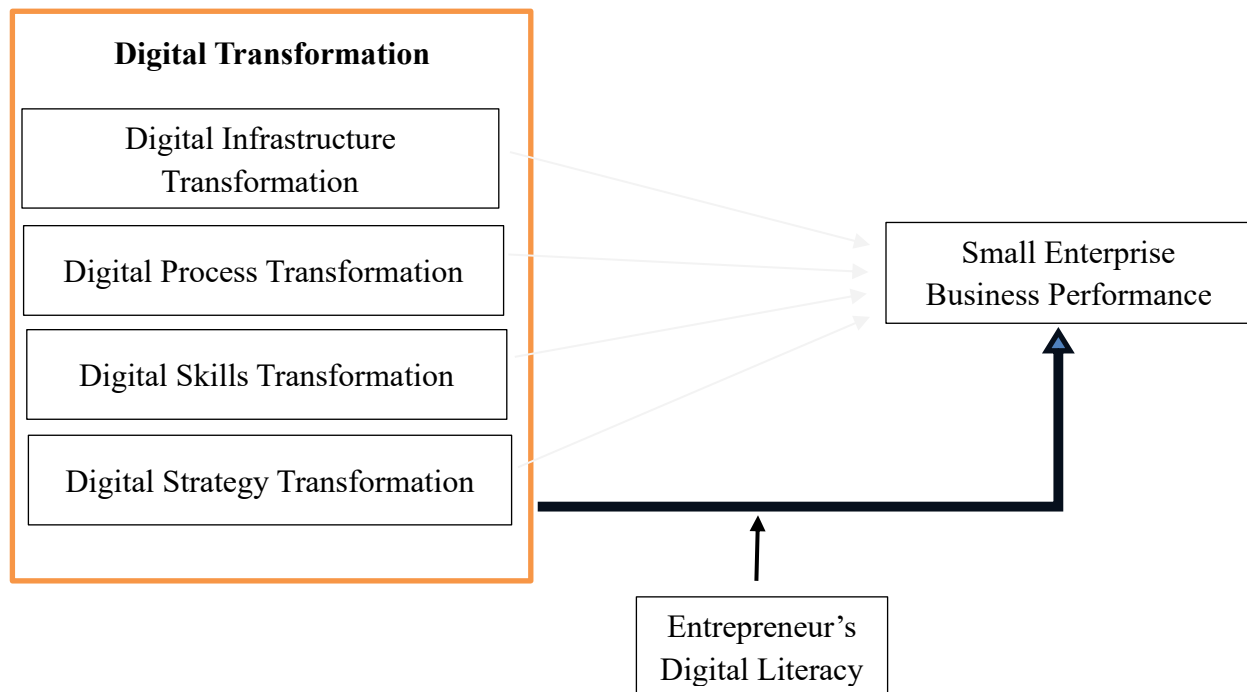


Figure 1: Conceptual framework of the study

Digital transformation can be conceptualized as having four (04) dimensions, as mentioned above. That is Digital infrastructure, Digital processes, Digital skills and Digital strategy. The following definition could be conceptualized as depicted above. Digital transformation (DT) is the comprehensive process of adopting digital technologies to fundamentally reshape how a business or organization functions, creates value, and engages with its customers. Digital transformation is viewed as going beyond the implementation of digital technology, aiming to develop a completely new company or organizational culture. Some key factors in a digital transformation program include improving efficiency, developing new business models, and serving consumers through data and digital technology. As Paul et al. (2024) observed, multiple departments, including marketing, play a critical role in such transformations, with the objective of ensuring that digital transformation aligns with organization-wide objectives.

Digital infrastructure is the physical foundation that supports digital systems, such as internet access, hardware components, and network performance, which work collectively to enable access to digital services essential for carrying out business operations (Jeza & Lekhanya, 2022). Digital processes involve integrating digital technology into business operations, such as online shopping platforms and digital payment systems, which ultimately enhance efficiency, improve consumer services, and gain a certain degree of competitiveness (Chiang et al., 2020). Digital skills refer to the abilities or body of knowledge required to use digital technology effectively in business operations and to adapt to new technological trends in the business environment (Sousa and Rocha, 2025). Digital strategies basically refer to a certain strategic plan for using digital technology for meeting business objectives. It could be formalized or informalized during its development process, helping ensure that business objectives are aligned with digitalization processes (Vrontis et al., 2022).

Small enterprises' business performance is measured by the activities of small enterprises, covering financial aspects such as growth in sales or profitability, as well as innovation strength, where the development of new products or services is a key example of such measurement (Jeza & Lekhanya, 2022). There are two dimensions in measuring business performance: financial performance and innovation capability. Financial performance measures an organization's financial soundness by assessing its efficiency in generating revenues or earnings from profit-generating activities. This can be determined by sales growth, profitability, return on assets, or cash flow, which disclose its effectiveness in utilizing resources to meet the financial objectives of the business entity. Innovation capability is the enterprise's ability to develop innovative products, services, processes, or

business models. It also entails the ability to create value, which gives it a distinctive advantage that is an important consideration for growth and for responding to dynamic markets (Oke et al., 2007). Digital literacy, the moderator variable in the study, is viewed as the ability or confidence of the entrepreneur to understand, evaluate, or make effective use of digital platforms, encompassing both skill mastery and self-efficacy (Human Capital Theory, n.d.).

Based on the given conceptual framework and the operationalization of the variables for this study, the following set of research hypotheses is formulated to empirically test the relationship between digital transformation factors, small enterprises' business performance, and the moderating role of digital literacy of entrepreneurs. This set of research hypotheses is grounded in a theoretical argument supported by previous empirical research, as well as the unique context-based features of trading-related small enterprises in the Matale District of Sri Lanka.

H1: Digital infrastructure transformation of the trading sector, small enterprises have a statistically significant positive impact on their business performance

H2: Digital process transformation of the trading sector small enterprises has a statistically significant positive impact on their business performance

H3: Digital skills transformation of the trading sector small enterprises has a statistically significant positive impact on their business performance

H4: Digital strategy transformation of the trading sector small enterprises has a statistically significant positive impact on their business performance

H5: The overall digital transformation, measured as a combination of digital infrastructure, process, skills and strategy of trading sector small enterprises, has a statistically significant positive impact on their business performance

H6: Entrepreneurs' digital literacy moderates the impact of overall digital transformation on the business performance of trading-sector small enterprises.

Sample and data collection

This study aims to analyze the impact of digital transformation on the business performance of trading sectors of small enterprises. According to the SME policy framework of Sri Lanka small businesses, a small enterprise is defined as a business entity that employs fewer than 50 but more than

10 employees and has an annual turnover between 16 and 250 million Rupees (Ministry of Industry and Commerce, 2012). The study population is defined by using the Department of Census and Statistics, Economic Census 2013/14 (Listing Stage Report). According to this report, Matale district has 25,784 total establishments, and 7.2% are classified as small, which results in 1856 enterprises being considered the population of the study. Using Morgan's formula for sample size determination, assuming a 95% confidence level and a 5% margin of error, the calculated sample size is 384 small enterprises.

Small enterprises in the trading sector operating in Matale district, comprising wholesale and retail trade, agribusiness trading, textile and apparel trading, import–export trading, and food and beverage trading, were considered for the study. Due to the absence of a detailed sampling frame for small trading businesses and the informal nature of some businesses, the study adopted a non-probability purposive sampling design, which was further facilitated by the use of snowball sampling. Data were collected using a structured questionnaire that focused on the essential parameters of digital transformation and business literacy, and were conducted online via Google Forms for easy, free access by respondents. The questionnaire was administered to about 800 small business entrepreneurs through various networks, and follow-ups were conducted systematically to enhance response rates. A total of 282 usable questionnaires were collected and considered for analysis, and are sufficient for scientific investigation and moderation analysis.

This study adopts a quantitative, cross-sectional explanatory research design, appropriate for empirically testing hypothesized relationships and moderation effects among variables. The process of data analysis involves both descriptive and inferential statistical techniques. Descriptive statistics were applied to establish patterns, trends, and relationships, and to make it easier to understand and interpret the study's implications. To explain the relationship between the digital transformation and business performance, correlation and regression analysis were used. To examine the moderating effect of digital literacy on these relationships, Model 4 of the PROCESS macro developed by Hayes (2013) was used in SPSS, which facilitates testing of moderating models through bootstrapped estimates.

Results and data analysis

Demographic profile of the sample

A total of 282 small businesses in the trading sector operating in the Matale District participated in the questionnaire survey. More than three-fourths of the respondents were males (76.2%). Most of their businesses were operated by individuals within the economically active age group between 36 and 45 years (48.6%) and 46 to 55 years (32.3%), reflecting an experienced pool of entrepreneurs, but lesser number representing generation Z. Most of the respondents had up to Advanced level of education (48.6%), with an educational achievement of diploma or higher (38.3%), reflecting some level of human capital development. Textile and garment trading was the dominant sector (34%), trailed by food and beverages (20.6%). Most business Source es were small, employing 11 to 20 employees (50%) and having been in operation for 4 to 6 years (36.2%). A sole proprietorship was the most dominant business structure (79.8%).

Validity and reliability of the measurement model

Convergent validity of the measurement model was assessed using Composite Reliability (CR) and Average Variance Extracted (AVE) to confirm satisfactory internal consistency and variance capture for all constructs. Discriminant validity was assessed using the Fornell–Larcker criterion, in which the square roots of the AVEs exceeded the inter-construct correlations, indicating acceptable construct validity across all dimensions. Table 1 below presents the AVE and CR for the study's constructs.

Table 1: Convergent Validity

Variables / Constructs	AVE	CR
Digital Infrastructure	0.58	0.95
Digital Process	0.68	0.86
Digital Skills	0.53	0.72
Digital Strategy	0.59	0.74
Standard cutoff	0.5	0.7

Source: Survey report

All constructs surpassed the minimum Average Variance Extracted (AVE) of 0.5 and Composite Reliability (CR) of 0.7, confirming strong convergent validity and excellent internal consistency of the measurement model. Discriminant validity was also checked to ensure that constructs are not too closely related to other constructs, and that the measurement model is accurate and meaningful (Taherdoost, 2018).

Table 2: Discriminant Validity

	Digital Infrastructure	Digital Process	Digital Skills	Digital Strategy
Digital Infrastructure	.76	.769	.727	.445
Digital Process	.769	.82	.731	.442
Digital Skills	.727	.711	.73	.400
Digital Strategy	.445	.442	.400	.77

Note: The bolded diagonal elements are the square roots of each construct's AVEs, which should be greater than the correlations among the independent variables.

According to the results presented in Table 2, the square roots of the AVEs for most constructs, ranging from 0.73 to 0.82, exceed the correlations with other constructs, thereby indicating satisfactory discriminant validity. However, certain correlations (between digital infrastructure and digital process (0.769) and between digital infrastructure and digital skills (0.727)), closer to their square root values, reflecting a probable overlap that needs additional investigation. Therefore, to validate these constructs, HTMT (Heterotrait-Monotrait) ratios were calculated.

Table 3: HTMT (Heterotrait-Monotrait) ratios

Construct Pair	HTMT Ratio
Digital Infrastructure & Digital Process	0.813
Digital Infrastructure & Digital Skills	0.847
Digital Infrastructure & Digital Strategy	0.802

Digital Process & Digital Skills	0.847
Digital Process & Digital Strategy	0.803
Digital Skills & Digital Strategy	0.802

HTML Ratio should be < 0.85

Source: Survey report

All HTMT ratios are below the 0.85 threshold, indicating that the constructs exhibit sufficient discriminant validity. This suggests that each construct is distinct enough from the others, supporting the validity of the measurement model.

Cronbach's Alpha values were computed for all constructs to assess their internal consistency and presented in Table 4. The alpha values indicate the internal consistency of the elements and indicate high reliability, indicating that the items within these constructs reliably assess the intended concept.

Table 4: Cronbach's Alpha values of variables

Variable	Cronbach's Alpha Value
Digital Infrastructure	0.703
Digital Process	0.871
Digital Skills	0.875
Digital Strategy	0.779
Business Performance	0.759
Digital Literacy	0.912

Source: Survey Report

Descriptive statistics

Table 5 presents the descriptive statistics for the study variable, including the number of valid responses (n), mean, standard deviation, variance, and minimum and maximum values. The sample

size is 282 and hence the valid responses were consistent across the variables. The responses ensuring comparability among variables.

The mean values represent the average of responses for each variable. The mean value of business performance is 3.948, it is generally good and comparatively stable. Digital Strategy has a mean score of 3.898, indicating a favorable view of strategic digital initiatives. The mean scores for Digital Skills and Digital Processes are 3.65 and 3.546, respectively, reflecting moderate levels of accepted digital competencies and methodologies. The mean scores for Digital Infrastructure and Digital Literacy are 3.607 and 3.409, respectively, indicating that these areas are considered somewhat less developed or less prioritized than others.

Table 5: Descriptive Statistics for Independent, Dependent and Moderating variable

	Digital Infrastructure	Digital Process	Digital Skills	Digital Strategy	Business Performance	Digital Literacy
Valid	282	282	282	282	282	282
Mean	3.607	3.546	3.65	3.898	3.948	3.409
Std. Deviation	0.785	0.873	0.817	0.869	0.758	0.922
Variance	0.617	0.761	0.667	0.756	0.575	0.85
Minimum	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00

Source: Survey data

The standard deviation scores range from 0.758 (Business Performance) to 0.922 (Digital Literacy). A high standard deviation score is associated with Digital Literacy, suggesting a high level of diversity in digital literacy among small-business entrepreneurs. On the contrary, a low standard deviation score is associated with Business Performance, which implies a low level of diversity in business performance. Taken together, these scores indicate a moderately high dispersion of data points.

The variance values provide further clarification of the response data, with the highest, 0.85, belonging to Digital Literacy. This means that there is more scatter or dispersion in this particular construct. A significant amount of scatter or variation is also observed in Digital Process (0.761) and Digital Strategy (0.756), indicating moderate disagreement or divergent views among respondents. Lower variation, or greater consistency, is observed in the constructs of Digital Infrastructure (0.617) and Business Performance (0.575).

The lowest and highest values for all constructs are 1.00 and 5.00, respectively, corresponding to the endpoints of the Likert scale used. This indicates that respondents selected the full range of responses, from the minimum to the maximum, for each construct. The presence of both minimum and maximum values across all categories indicates a comprehensive range of perspectives, with some respondents assigning very low ratings and others very high ratings, illustrating varied opinions within the sample.

Hypotheses testing

A Simple Regression Analysis was carried out to test the validity of the Hypotheses developed to measure the influence of digital transformation in small businesses, as measured by digital infrastructure, digital processes, digital skills, and digital strategy, on their business performance. As the first step, multicollinearity among the independent variables was tested to detect if any two independent variables are correlated. As shown in table 6 below, no pairwise correlation exceeded 0.8, indicating no severe multicollinearity and, hence, qualifying for multiple linear regression analysis. Further, the results of the correlation analysis underscore that expanding digital infrastructure, processes, skills, and strategic planning are positively associated with business performance.

Table 6: Pearson's Correlation Coefficient

		Digital Infrastructure	Digital Process	Digital Skills	Digital Strategy	Business Performance
Digital Infrastructure	Pearson	1	.769**	.747**	.445**	.715**
			<.001	<.001	<.001	<.001
	Sig. (2-tailed)					

Digital	Pearson Correlation	.769**	1	.731**	.442**	.699**
Process	Sig. (2-tailed)	<.001		<.001	<.001	<.001
Digital	Pearson Correlation	.747**	.731**	1	.400**	.676**
Skills	Sig. (2-tailed)	<.001	<.001		<.001	<.001
Digital	Pearson Correlation	.445**	.442**	.400**	1	.453**
Strategy	Sig. (2-tailed)	<.001	.001	<.001		<.001
Business	Pearson	.715**	.699**	.676**	.453**	1
Correlation		<.001	<.001	<.001	<.001	
Performance	Sig. (2-tailed)					

Source: Survey Report

Multiple linear regression analysis was employed, with digital infrastructure, digital process, digital skills, and digital strategy as independent variables and business performance as the dependent variable.

Table 7: Results of the Regression Analysis

Variables	Unstandardized coefficient	Standardized coefficients	T	Sig (p)	R-squared of the regression
	Beta	Std. Error	Beta		
Digital Infrastructure	.691	.040	.715	17.123	.000**
Digital Process	.587	.036	.699	16.376	.000**
Digital Skills	.587	.038	.676	15.367	.000**
Digital Strategy	.395	.046	.453	8.500	.000**

*The dependent variable is Business performance. ** Correlation is significant at the 0.01 level (2-tailed)*

Source: Survey Report

The results of the regression analysis reveal that all four variables of digital transformation, digital infrastructure, digital process, digital skills, and digital strategy, impose a significant positive impact on the business performance of small businesses. Among these four variables, digital infrastructure is the most influential, as indicated by the highest standardized beta coefficient (0.715). This suggests that small businesses can improve performance by enhancing their digital infrastructure. Digital processes and digital skills are also significant, as indicated by their standardized beta coefficients of 0.699 and 0.676, respectively. However, despite its positive contribution, digital strategy has the least significant positive influence, with a standardized beta coefficient of 0.453. Notably, all predictor variables are significantly associated with business performance, as they are all significant at $p < 0.001$, suggesting that their effects are unlikely to be due to chance. Therefore, all Hypotheses H1 to H4 are confirmed at the 99% confidence level. Generally, the findings suggest that investments in digital infrastructure of small businesses.

The R value of the regression is 0.772; this implies that, overall, the tested factors of digital transformation have a strong influence on performance. Further, the R-squared value of 0.596 indicates that about 59.6 per cent of the variation in small-business performance can be explained by the combined effects of digital infrastructure, processes, skills, and strategy. This observation also makes it clear that these elements are important variables in determining performance outcomes for small-scale businesses operating in the trading sectors of the Matale District. Overall, this model shows that the predictable portion of overall business performance largely depends on the maturity of the digital variables, underscoring the importance of these capabilities for improving the success of small-scale businesses.

Moderation analysis with PROCESS Macro

The PROCESS macro, created by Andrew, was employed for moderation analysis. The macro evaluates whether the interaction term between the Digital Transformation and the moderator variable Digital Literacy significantly predicts the business performance. Digital Transformation was estimated as a composite variable for this analysis. Hence, the average response for all four digital transformation dimensions was computed and incorporated as the independent variable in the regression analysis,

along with the moderator variable Digital Literacy and the interaction term (Digital Transformation x Digital Literacy).

Table 8: Results of the Moderator Analysis

Predictor	B	SE	t	p
Constant	-.0140	.4133	-.0338	.9731
Digital Transformation	.2353	.0305	7.7141	.0000
Digital Literacy	.4624	.1353	3.4179	.0007
Digital Transformation x Digital Literacy (interaction)	-.0206	.0083	-2.4844	.0136
<i>R - Squared</i>	<i>0.6174</i>			
<i>Mean Squared Error (MSE)</i>	<i>0.2223</i>			
<i>F Statistics</i>	<i>149.5385 (p value 0.000)</i>			

Source: Survey data

The regression results presented in Table 8 provide multiple insights into the determinants of business performance. The constant term fails statistical significance, suggesting that when all predictors are zero, there is no substantial baseline effect on business performance.

The independent variable, digital transformation, demonstrates a positive and statistically significant impact ($B = 0.2353$, $p < 0.001$). This indicates that a higher level of digital transformation improves the business performance of small enterprises, providing evidence in support of H5. The level of the entrepreneur's digital literacy shows a positive, statistically significant impact on business performance ($B = 0.4624$, $p = 0.0007$). This reiterates the importance of digital literacy as a basic element in enhancing the performance of small businesses, possibly by facilitating the use of digital technologies. The statistically significant negative interaction term between digital transformation and digital literacy, indicating a moderating effect, confirms Hypothesis 6 ($B = -0.0206$, $p = 0.0136$). This finding indicates that the entrepreneur's digital literacy moderates the relationship between digital transformation and business performance; thus, the more the business owner possesses digital literacy, the weaker the positive effect of digital transformation on business performance. This is possibly

because digital literacy complements business capabilities, rendering the additional contribution from digital transformation irrelevant.

The results of the regression analysis show that the model is robust. The R-squared statistic of 0.6174 indicates that the model explains 61.74% of the variability in business performance, suggesting high explanatory power. The Mean Squared Error of 0.2223 shows the average squared difference between observed and predicted values, with smaller values indicating higher accuracy. The F-statistic of 149.5385, along with a p-value of 0.0001, indicates that the overall regression model is highly significant.

Discussion

This study investigates the effect of the components of digital transformation, namely digital infrastructure, digital processes, digital skills, and digital strategy, on business performance, particularly as affected by the role of the entrepreneur's digital literacy. The findings confirm Hypothesis 1 and thus provide evidence that the progression of utilization of digital infrastructure has a significant and positive effect on the business performance of small enterprises. Firms with better digital infrastructure, such as internet connectivity and hardware, are more likely to achieve high levels of firm performance. As reported by Jeza & Lekhanya (2022) and Vrontis et al. (2022), good digital infrastructure has a significant effect on firm performance, as it enhances operational effectiveness and connectivity, as well as the ability to leverage digital opportunities.

Hypothesis 2 is also confirmed: effective digital processes positively affect business performance. More efficient digital processes lead to higher productivity and competitiveness. Based on Kyurova (2022) and Diaz et al. (2024), the use of digital processes such as e-commerce and digital payments increases operational efficiency, ultimately leading to enhanced performance for SMEs. Hypothesis 3 is confirmed, as employees' digital skills in small businesses are an essential requirement for fully utilising digital resources, thereby increasing business performance. Based on the Theory of Human Capital and Social Cognitive Theory, higher proficiency and flexibility of employees in digital tools/technologies significantly lead to enhanced innovation and, in turn, positive business performance. The results also confirm Hypothesis 4, implying that a distinct digital strategy synchronizes digital initiatives with business strategies, leading to better performance. The fact that a distinct digital strategy, as quoted by Vrontis et al. (2022) and Kyurova (2022), enables SMEs to provide clear direction and allocate resources, leading to better performance metrics. In totality, these

outcomes validate that a strong digital backbone, including infrastructure, processes, human capacity, and strategy, is essential for small enterprises' success, thereby attesting to Hypothesis 5. By integrating technology into day-to-day activities, small businesses can embark on a full-scale digital transformation and perform better. In contrast, after applying moderation, a significant negative moderating role of digital literacy becomes evident. This suggests that while digital literacy contributes to better business performance, its effect is weaker at higher levels of digital literacy, as the benefit of digital transformation in improving performance becomes weaker.

The negative moderating effect found in the research above corresponds with the following theoretical views and findings from existing literature in the same manner to jointly explain the reasons why increased digital literacy or the goal of digital transformation fails always to ensure improvements in business performance outcomes, especially among small businesses operating within the Matale District in Sri Lanka. One important rationale is based on the concept of diminishing returns. It suggests that the benefit derived from the presence and use of digital or technological resources can stop and even reverse beyond a point after their acquisition and application (Samsuden et al. 2024). On a simplified note, small businesses could see improvements in business outcomes as they are better equipped and more literate in technology, but may not benefit from additional inputs beyond a point, as they may not use them or end up incurring negative outcomes.

Higher costs associated with digital transformation are a noticeable factor that could negatively impact the organisation's performance in this case. Digital adoption requires a high cost of digital transformation that will not yield immediate financial returns on investment to improve performance in the digital economy. Chen and Zhu (2024) highlight that the high costs of digital transformation can temporarily or permanently impact financial performance in organisations.

Furthermore, the specific scenario of small businesses and digital transformation in a country like Sri Lanka adds complexity to the equation. Empirical research has found that small businesses tend to experience problems with limited access to technological knowledge, inadequate training in technology, and ways and means to address technological issues (Ranatunga et al., 2020). Each one of these factors is important for guaranteeing that any gain from digital literacy is achieved (Ranatunga et al., 2020).

Conclusion

The main focus of this research is to determine the impact of efforts to digitize small business organizations on digital infrastructure, processes, skills, strategy, and literacy on the organizations' performance. The analysis shows that all variables under consideration are significantly and positively related to the performance of small business organisations. The variables have been found to account for 61.74% of the variability in the dependent variable.

The study also reveals that digital literacy generally supports business performance, though an interesting pattern emerges: higher levels of digital literacy may reduce the effectiveness of digital transformation. This result provides evidence that while digital literacy equips small business owners with exceptional skill sets, extremely high levels of literacy might pose diminishing returns or even hubris about future implementation levels of digital transformation. In general, however, the findings confirm the critical role played by digital skills in the overall success of small business ventures. There can be no doubt that small business ventures that fully integrate appropriate digital infrastructure, skills, and solutions will generally perform well, as evidenced by their superior results. In fact, the findings and test results combine to confirm that digital transformation encompasses much more than technological growth; rather, it involves an approach focused on business sustainability and development.

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