

Digital Economy Competencies Through a Knowledge Management Lens: Identifying the Drivers of Managerial Performance

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Abstract: Even with massive investments in digital transformation, manufacturing firms in emerging economies continue to demonstrate poor performance as a result of low workforce readiness to adopt new technologies. This study diverges from traditional research focus on technology implementation, examining instead the effect of digital economy capabilities on managerial performance from the standpoint of Knowledge Management (KM). It conceptualises digital competencies as human-centric and infrastructural KM capabilities using the Sarawak Digital Economy Competency (SarDEC) model. Using Partial Least Squares Structural Equation Modelling (PLS-SEM), this quantitative study analyses the survey data of 385 managerial and technical employees in Sarawak's manufacturing sector. Managerial performance is found to be significantly driven by the human-centric KM competencies of digital literacy, digital communication, business enablers, and competency development. Showing no significant direct effects on performance are digital infrastructure and content creation. This means that performance improvements are primarily determined by human knowledge interpretation and application once the technology threshold is reached. Despite the Malaysian manufacturing setting, the findings are generalisable to other developing economies in the region investing in digital transformation.

Keyword: Knowledge management capabilities, Digital economy competencies, Digital literacy, Competency development, Managerial performance

1. Introduction

Organisations must continue developing their knowledge resources to stay competitive in a rapidly changing and digitalised global economy (Owen, 2015). Digital transformation, from the lens of Knowledge Management (KM), is driven by both technological and knowledge-based processes, the latter of which encompasses knowledge creation, sharing, and application. But even with the proliferation of Industry 4.0 technologies, there remains an imbalance between technological advancement and workforce knowledge capability. As employee knowledge and digital competencies continue to be disregarded, digital investments too continue to be underutilised (Cetindamar et al., 2021). The digital adoption–workforce readiness imbalance is rather prevalent in Malaysia (Kee et al., 2025). Upskilling efforts seem ineffective in aligning workforce knowledge capabilities with the demands of Industry 4.0 (Senadjki et al., 2025), exacerbated by employee scepticism and knowledge uncertainty (Turner et al., 2024). Malaysia's digital transition, hence, seems to be mostly hindered by poor knowledge management. Although Sarawak made a strategic move towards becoming a knowledge-driven economy with the introduction of the Sarawak Digital Economy Strategy 2018–2022 and the Sarawak Digital Economy Blueprint 2030 (Ashari & Farouk, 2023), knowledge capabilities encompassing knowledge sharing, integration, and application remain indispensable in ensuring the initiatives' success (Utiti et al., 2020). Knowledge diffusion and digital exposure remain low in rural areas, hindering knowledge application (Sandun et al., 2023) and impeding organisational effectiveness due to low levels of literacy, communication, cybersecurity awareness, and innovation. While performance and security outcomes have been linked to knowledge-based competencies (Kamarulzaman et al., 2024), such competencies remain rare in Malaysia and elsewhere worldwide (OECD, 2024). In Sarawak's manufacturing sector, the adequacy of knowledge management capabilities for supporting Industry 4.0 transformation has not been properly studied. The current study addresses this gap by framing digital economy competencies as a knowledge-based capability affecting organisational readiness for digital transformation.

2. Literature Review and Hypothesis Development

2.1 The Knowledge Management Lens

Knowledge Management (KM) is the systematic creation, sharing, storage, and application of knowledge to boost organisational performance. Organisational knowledge, as per Nonaka and Takeuchi (1995), is the result

of continuous tacit–explicit knowledge interaction, leading to innovation and long-term competitive advantage. Knowledge primarily drives the effective conversion of technology into operational performance. But previous digital transformation studies rarely explored the topic of knowledge creation and application, favouring instead the topics of technology, infrastructure, and system adoption. Without effective digital knowledge interpretation, sharing, and utilisation, technology investments will not necessarily lead to improved organisational performance. The KM lens is hence used in this study to explain the effect of digital economy competencies on managerial performance. Here, digital economy competencies encompass organisational capabilities that enable knowledge acquisition, sharing, integration, and application. Human-centric competencies like digital literacy, digital communication, business enablers, and competency development enable effective knowledge usage, whilst technological infrastructure eases knowledge flow.

2.2 Theory

Three theoretical frameworks serve as the underpinning theories in this study, namely the Human Capital Theory (HCT), Resource-Based View (RBV), and Technology Acceptance Model (TAM).

2.2.1 Human capital theory (HCT)

This theory asserts that a firm's collective knowledge, cognitive skills, and intrinsic competencies crucially determine its performance, economic value, and technology adaptation capacity (Kang & Lian, 2025). In relation to manufacturing firms pursuing digital transformation, this theory posits the prevalence of limited structural investments in advanced manufacturing technologies along with poor employee capabilities. But this theory traditionally treats knowledge as static, gained only from formal education or periodic training. This study challenges this view, contending that human capital is actually dynamic, whereby learning, knowledge creation, and cross-functional upskilling are constant. Employee competency in smart manufacturing firms means the intellectual capacity to absorb, interpret, and integrate complex information into operational routines. Human capital, therefore, is the key cognitive capacity for translating raw digital inputs into actual operational actions.

2.2.2 Resource-based view (RBV)

The sustained competitive advantage is made possible by the possession of valuable, rare, inimitable, and non-substitutable resources (Assensoh-Kodua, 2019). Physical technology and IT infrastructures can be duplicated or attained from open markets, but the organisational routines, tacit knowledge, and specialised competencies for operating such resources are highly unique (Sharma et al., 2024). The RBV through KM lens highlights the need to distinguish static digital resources (e.g., cloud platforms, physical networks) from dynamic knowledge-based capabilities (e.g., data literacy, digital governance). Digital competitiveness is not the direct outcome of technological possession; for that to transpire, internal knowledge assets must be aligned with external demands be it from suppliers, market regulators, or digital platforms. Hence, the RBV is used in this study to place the SarDEC model's competencies as internal, knowledge-based capabilities which transform digital investments into inimitable organisational assets driving performance.

2.2.3 Technology acceptance model (TAM)

This model is used to explain user acceptance of a new system based on its Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Leesakul et al., 2022). Despite its proven reliability in predicting initial technology adoption, the TAM's standard applications have repeatedly been called out for ignoring post-implementation organisational realities, including in smart manufacturing settings (Schorr, 2023). Hence, the KM lens is incorporated into the TAM framework in this study, asserting that a system's perceived usefulness and ease of use are directly shaped by the firm's effective sharing, communication, and institutionalisation of technical knowledge. Without clear knowledge transfer mechanisms, employees would develop doubt and even fear over the introduction of new enterprise resource planning (ERP) systems or automated dashboards (Turner et al., 2024). The TAM is used in this study to show the importance of organisational capacity in facilitating knowledge flow, leading to low user resistance, change readiness, and ultimately sustained technology utilisation.

2.3 Conceptualising the Variables

2.3.1 Managerial performance

Managerial performance in manufacturing firms relates to the efficient coordination of digital resources, cross-functional team supervision, and the strategic translation of high-level objectives into structured operational practices. In this instance, middle managers act as the primary conduit filtering executive vision towards shop-floor execution. The KM lens treats managerial performance as the assessment of decision-making quality

amidst the availability of massive data. Managers must constantly synthesise real-time production analytics, solve structural communication holdups, and foster a collaborative learning environment. This study does not assess generic administrative outputs; rather, it explicitly delineates managerial performance as the manager's operational capacity to leverage digital tools for optimising resource allocation, guiding workflows, and deriving quick data-driven decisions.

2.3.2 Business enablers

Business enablers are the organisational conditions, managerial support mechanisms, and strategic resources that drive digital initiative implementation. Business enablers in the SarDEC framework include leadership commitment, organisational alignment, resource allocation, innovation support, and performance management systems which all lead to digital transformation. The KM lens treats business enablers as organisational mechanisms facilitating the creation, sharing, and application of knowledge across functional units. Supportive leadership, organisational culture, and strategic alignment have been indicated as key factors driving knowledge management and digital transformation initiatives (Warner & Wäger, 2019). Lack of organisational support would render the inability of employees to access, share, and apply the needed knowledge for making decisions. This study defines business enablers as organisational KM capabilities that drive the transformation of digital competencies into managerial performance outcomes.

2.4 Hypothesis Development

2.4.1 Business enablers and managerial performance

Individual competencies pursuing industrial transformation, can only flourish under low structural friction. The KM lens frames business enablers as the institutional and cultural infrastructure (e.g., executive sponsorship, resource commitment, aligned incentive systems) which facilitate effective knowledge flow. Middle managers in many manufacturing firms face operational restrictions in the form of, among others, fragmented data siloes, information hoarding, and poor decision-making autonomy. In such conditions, valuable data are trapped and cannot be converted into useful operational knowledge. Business enablers serve as institutional catalysts freeing human capital and operational resources. They enable middle managers to synthesise cross-functional data, derive quick decisions, and turn strategic goals into operational routines effectively and efficiently. Without these enablers, rigid corporate structures would limit individual technical skills (Bharadwaj et al., 2013). Studies have also shown that business enablers such as leadership support, strategic alignment, and organisational readiness can significantly boost managerial effectiveness in the pursuit of digital transformation. Strong executive commitment and robust organisational structures, for instance, enable firms to better share knowledge, collaborate cross-functionally, and make quality decisions. Hence, business enablers are necessary in driving digital competencies towards improving managerial performance.

H1: Business Enablers significantly and positively drive managerial performance.

2.4.2 Competency development and managerial performance

The KM lens frames competency development beyond human resources aspects, defining it as an continuous process of knowledge creation, transfer, and institutionalisation. From a manufacturing standpoint, technological shifts can cause technical skills to become obsolete, leading to uncertainties and anxiety among the workforce (Turner et al., 2024). Competency development programmes with the likes of digital training, peer mentorship, and cross-functional rotations can transform tacit employee knowledge into explicit organisational capabilities. The Human Capital Theory asserts that continuous upskilling can improve organisational cognitive capacity (Kang & Lian, 2025), a particularly crucial element for middle managers who must be able to spearhead technical change, assess operational risks, and optimise workflows (Talley & Hull, 2023). A continuous learning framework allows for an adaptable knowledge ecosystem, subsequently enabling managers to lead their teams through system transitions without much operational errors. Competency development, hence, is a key capability for maintaining operational efficiency. Employee adaptability, innovation capability, and managerial effectiveness have all been positively linked to competency development. Continuous learning boosts problem-solving skills, smoothen knowledge transfer, and improve managerial response to technological shifts. Hence, competency development reinforces the learning capacity and quality of managerial decision in organisations pursuing digital transformations.

H2: Competency Development significantly and positively affects managerial performance.

2.4.3 Digital communication competency and managerial performance

Beyond digital messaging tools or corporate email networks, digital communication competency, as per the KM lens, is a crucial socio-technical capability that ensures the accurate sharing, interpretation, and alignment of organisational knowledge, middle managers need quality and fast internal information flows. Weak digital communication competencies can result in information distortion, delayed feedback loops, and coordination failures, thus hindering managerial decision-making (Sony & Naik, 2020). On the contrary, strong digital communication competencies can optimise cross-departmental knowledge flows and facilitate the accurate interpretation of key operational data from the production floor and hence alignment with corporate strategies. By clarifying expectations and encouraging collaboration through digital channels, internal friction can be reduced. As posited by the TAM, user resistance can be reduced through effective digital communication whereby technical system requirements are explained clearly organisation-wide. Knowledge sharing, collaboration, and organisational coordination are driven by effective digital communication. Managers can better disseminate information, coordinate teams, and resolve operational issues when they possess strong digital communication competencies. This study links digital communication competency to enhanced managerial decision-making and organisational performance.

H3: Digital Communication Competency significantly and positively affects managerial performance.

2.4.4 Digital content and creation and managerial performance

The KM lens views digital content and creation as tools for transforming static organisational knowledge into dynamic systems for creating, sharing, and applying knowledge (Ren, 2023). Accessibility and usability can be improved using dashboards, multimedia guides, and integrated repositories, boosting knowledge sharing, decision-making, and operational efficiency (Olan et al., 2022). With better knowledge coordination, managerial and operational performance can be improved through the reduction of errors and improvement of knowledge utilisation. For Sarawak's manufacturing sector, digital content systems hence serve as KM enablers, reinforcing organisational coordination, adaptability, and performance.

H4: Digital Content and Creation positively affect managerial performance.

2.4.5 Digital infrastructure and managerial performance

The KM lens defines digital infrastructure as the technological foundation for real-time knowledge creation, storage, sharing, and application. Knowledge flow is supported by connectivity systems, data platforms, and integrated manufacturing systems, supplying timely and accurate information for managerial decision-making. Improvements to monitoring demand, inventory, machine performance, and workforce status further boost knowledge visibility and responsiveness (Khaled, 2025). Department-wide knowledge integration is facilitated by manufacturing execution platforms and cloud-based analytics, whilst shared platforms enable standardised information and better knowledge coordination (Allwein, 2017). Digital infrastructure helps hasten knowledge-driven decisions and streamlines cross-functional knowledge, thus improving managerial performance.

H5: Digital Infrastructure positively affects managerial performance.

2.4.6 Digital literacy competency and managerial performance

Digital literacy is the cognitive capacity to discover, assess, interpret, and use digital data to improve organisational operations. In the era of Industry 4.0, massive volumes of raw data are generated via ERP systems, automation dashboards, and predictive maintenance tools. Yet, they are rendered useless without the capability to transform it into practical business applications. Digitally incompetent managers would resort to intuition, subjective experience, or obsolete reporting methods, thus compromising operational efficiency (Gunawan et al., 2024). The KM lens frames digital literacy as the key cognitive filter that managers use to distinguish valuable insights from background data noise. Digital literacy enables managers to assess real-time performance trends, project supply chain bottlenecks, and make data-driven decisions for optimising resource allocation (Brynjolfsson et al., 2016). As per the RBV, this competence turns complex information systems into unique, knowledge-based capabilities, digital literacy, hence, is proposed.

H6: Digital Literacy Competency significantly and positively affects managerial performance.

2.5 The Proposed Conceptual Framework

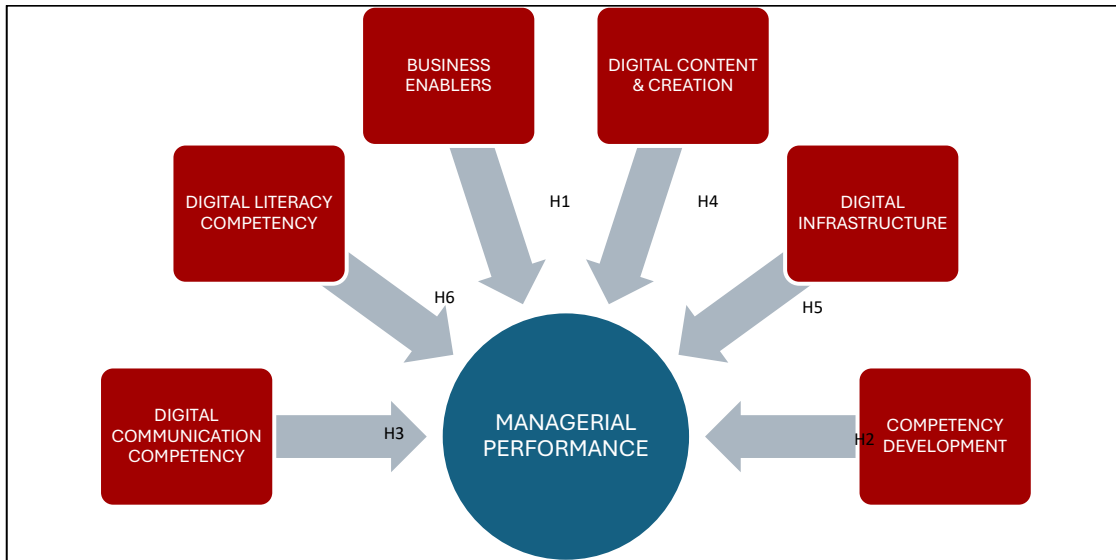


Figure 1: The conceptual framework

3. Methodology and Data Collection Procedure

A positivist quantitative research design was employed in this study, using objective measurements and statistical analyses to determine the variables' relationships (Saunders et al, 2023). Online questionnaires were disseminated to managerial and technical employees across Sarawak's manufacturing firms to collect data, receiving 385 valid responses. A five-point Likert scale (Joshi et al., 2015) was used to measure the constructs, of which items were taken from Leonardi and Treem (2020) and Weber and Staiger (2022).

4. Results

4.1 Descriptive Statistics

The 385 respondents' demographic profiles were analysed using SPSS Statistics. In terms of gender, 57.9% were male ($n = 223$) and 42.1% female ($n = 162$). Age-wise, 29.1% were between 21–30 years old, 37.1% between 31–40, 22.1% between 41–50, and 11.7% were above 50. In terms of education, 10.1% held secondary education or professional certificates, 28.1% diplomas or technical qualifications, 46.0% Bachelor's degrees, and 15.8% postgraduate degrees. This overview of the respondents' demographic profiles aids in the interpretation of the analysis results.

4.2 Measurement Model Assessment

The measurement model was found to be highly reliable and valid, after tested using Anderson and Gerbing's (1988) two-step approach. The internal consistency (composite reliability = 0.874–0.941) and convergent validity (factor loadings >0.50 ; AVE = 0.526–0.807) for all constructs were satisfactory. Discriminant validity was supported using HTMT, with all values <0.90 , confirming construct distinctiveness. These results indicate that the measurement model is robust and suitable for subsequent structural model analysis.

4.3 Structural Model Assessment

The structural model was assessed using PLS-SEM with a bootstrapping procedure of 10,000 resamples (see Table 1).

Table 1: Hypothesis testing for direct effect / structural model assessment

Hypothesis	Relationship	B	Std. Dev	p	t	Decision
H1	Business Enables -> Managerial	0.247	0.080	3.063	0.001	Supported
H2	Competency Development -> Managerial	0.128	0.076	1.676	0.047	Supported

Hypothesis	Relationship	B	Std. Dev	p	t	Decision
H3	Digital Communication Competency -> Managerial	0.155	0.083	1.874	0.030	Supported
H4	Digital Content & Creation -> Managerial	0.071	0.060	1.189	0.117	Not Supported
H5	Digital Infrastructure -> Managerial	0.007	0.057	0.126	0.450	Not Supported
H6	Digital Literacy Competency -> Managerial	0.251	0.075	3.351	0.000	Supported

4.4 PLS Predict

The predictive relevance of the structural model was assessed using the Stone–Geisser Q^2 statistic through the blindfolding procedure. Q^2 values greater than zero indicate that the model has predictive relevance for the endogenous constructs (Hair et al., 2021). With an omission distance of 10, all Q^2 values were above zero, showing that the structural model has adequate predictive relevance for all endogenous construct.

5. Discussion

5.1 Business Enablers

At the managerial level, business enablers competency can be understood from a Knowledge Management (KM) perspective as the organisational conditions that support the creation, sharing, and application of knowledge for effective performance. These enablers include leadership support, resource availability, organisational alignment, incentives, and institutional systems that facilitate the use of digital and knowledge-based capabilities. Managers rely on these KM enablers to translate strategic knowledge into operational action, as they operate between strategy and execution. Knowledge flow barriers can be mitigated through supportive organisational conditions that enhance coordination, access to tools, training, and decision-making autonomy; otherwise, knowledge utilisation may be constrained by rigid structures and limited resources. Supportive organisational conditions are often a pre-requisite for individual skills (Bharadwaj et al., 2013). In the context of Sarawak's manufacturing sector, business enablers within the SarDEC framework function as KM catalysts that support the translation of knowledge-based competencies into managerial and organisational performance, although their role is better understood as enabling rather than directly determining outcomes.

5.2 Competency Development

The SarDEC framework positions competency development as a systematic mechanism driving the continuous creation and sharing of knowledge. Based on the empirical analysis, it has a positive and statistically significant effect on managerial performance ($\beta = 0.128$, $t = 1.676$, $p = 0.047$). Managerial performance is hence linked to continuous knowledge and skills development towards fulfilling the ever-changing industrial demands. But the small effect size suggests that the effect is incremental instead of dominant. This means that managers rely on structured learning pathways to convert digital strategies into operational routines. But even with the modest effect, its significance suggests the sustained relevance of workforce development in driving knowledge dynamism (García-Morales et al., 2012).

5.3 Digital Communication Competency

Beyond a technical message exchange, the KM lens defines digital communication competency as an organisational capability that enables the coordination and alignment of knowledge flows via digital platforms. Based on the structural model assessment, digital communication competency positively and significantly affects managerial performance ($\beta = 0.155$, $t = 1.874$, $p = 0.030$). Therefore, effective communication channels can improve coordination and lessen information distortion. With the knowledge that communication gaps hinder digital transformation (Sony & Naik, 2020), the findings demonstrate the key role of digital communication in driving capabilities that improve managerial coordination and decision-making.

5.4 Digital Content and Creation

The KM lens delineates digital content and creation competency as the ability to turn operational information into structured digital formats that facilitate reporting, communication, and collaboration. Research has identified digital content creation as a key competency driving communication and digital transformation (North

et al., 2020). It can help improve alignment, clarify expectations, and boost workflow, notably in Sarawak's manufacturing sector. Without overstating its effects, this competency however remains a facilitating mechanism from the standpoint of KM.

5.5 Digital Infrastructure

This capability entails the systems and platforms supporting knowledge flow, coordination, and decision-making. To access and apply operational knowledge, managers depend on enterprise systems, dashboards, and integrated platforms. Although strong infrastructure has been shown to improve the visibility and responsiveness of organisational processes (Tortorella et al., 2021), this study's findings suggest that digital infrastructure is not a significant driver of managerial performance and only serve as a baseline requirement. This aligns with past findings which assert that infrastructure is not the sole driver of organisational transparency and responsiveness as human capability development also plays a role (Mubarak & Petraite, 2020). In the case of Sarawak, regional connectivity also plays a part in influencing infrastructure effectiveness (Sendera et al., 2023).

5.6 Digital Literacy

Digital literacy for managers entails their capability in acquiring, interpreting, and applying digital knowledge. This capability facilitates data interpretation and evidence-based decision-making (Brynjolfsson et al., 2016). Digitally illiterate managers would resort to using their intuition. This current study links digital literacy to the improved alignment between operational knowledge and organisational goals. Nonetheless, this capability does not work in isolation as its effect on performance may be complimented by other competencies (Dijk, 2020).

6. Conclusion, Limitations, and Recommendations

6.1 Conclusion

This study explored the effect of digital economy competencies on the managerial performance of Sarawak's manufacturing sector. Leveraging on Knowledge Management, the study is underpinned by the Human Capital Theory (HCT), Resource-Based View (RBV), and Technology Acceptance Model (TAM). In the study's context, managerial performance has a significant link with the human-based KM capabilities of digital literacy, digital communication, business enablers, and competency development, all of which enable managers to coordinate, interpret, and apply digital knowledge. On the contrary, digital infrastructure, governance, and security demonstrate no significant direct effect on managerial performance (H4, H6), indicating their foundational or supporting role. The findings ultimately confirm the KM and socio-technical views (Orlikowski, 2000) that digital transformation is the outcome of knowledge-based human capabilities rather than solely a technological output.

6.2 Limitations

The study's cross-sectional nature and usage of self-reported data hinder causal interpretation. Sectoral or regional generalisability of the findings may also be affected due to the sole focus on manufacturing firms in Sarawak.

6.3 Recommendations

Human-centric KM competencies like digital literacy, communication, continuous learning, and knowledge application should be prioritised in future digital transformation initiatives, instead of focusing only on infrastructure development. This would help improve knowledge sharing and decision-making. Meanwhile, policymakers and training institutions should advocate for competency-based digital development to fulfil industrial demands.

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AI Declaration: AI tools such as ChatGPT were used for language refinement only.

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