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THE MEDIATING EFFECT OF KNOWLEDGE MANAGEMENT CAPABILITY ON THE RELATIONSHIP BETWEEN HRM PRACTICES AND RADICAL INNOVATION AMONG MALAYSIA ICT SMES

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Abstract:

For companies that work in quickly changing technology contexts, radical innovation has become a must-have strategic goal. However, organizations—especially small and medium-sized enterprises (SMEs) in emerging economies—still have a hard time developing the internal skills they need to make such changes happen. Although human resource management (HRM) practices are broadly acknowledged as facilitators of employee competency and organisational learning, the mechanisms by which HRM fosters radical innovation are little examined. This study examines whether knowledge management competence (KMC) serves as a mediator in the relationship between HRM practices and radical innovation capability within ICT SMEs in Malaysia. A survey involving 200 SMEs in the Klang Valley was executed, and the data were evaluated via Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings demonstrate that whereas HRM practices exert a substantial impact on KMC, KMC does not serve as a significant mediator in the relationship between HRM practices and radical innovation. The results show that ICT SMEs have structural and contextual problems when it comes to using knowledge resources to make radical innovations. These problems include not having enough absorptive ability, a culture of taking risks, and being ready for change. This research enhances the literature on HRM–innovation connections in emerging markets and provides actionable insights for bolstering knowledge-driven initiatives to foster innovation.

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Introduction

In a time where technology is changing quickly and products don't last long, innovation has become a key factor in whether or not a business can survive and be competitive in the long run. Incremental innovation helps companies improve their current goods and processes, whereas radical innovation—creating completely new products, services, or technologies—helps companies transform markets and deal with sudden changes. This kind of innovation is especially important in fields that need a lot of expertise, like information and communication technology (ICT), because technology changes quickly and competitive edges are readily lost.

Small and medium-sized firms (SMEs) are very important to national innovation systems, especially in countries that are still developing. In Malaysia, ICT SMEs are important to the country's plans for a digital economy and its goals for Industry 4.0. Even though they are strategically important, many Malaysian ICT SMEs still depend on small improvements and have a hard time coming up with big new ideas that can provide them a long-term competitive edge. Previous research indicates that these limits arise not solely from resource restrictions, but also from inadequate organisational capacities to generate, integrate, and utilise information in innovative manners.

From a knowledge-based view (KBV) of the enterprise, knowledge is seen as the most important resource for innovation. Radical innovation necessitates that companies transcend conventional knowledge utilisation and participate in more profound processes of knowledge generation, recombination, and application. These processes are inherently intricate and unpredictable, necessitating coordinated organisational structures instead than solitary human endeavours.

For a long time, people have known that human resource management (HRM) techniques are very important for helping organisations develop and come up with new ideas. Training and development, performance reviews, and reward systems are examples of practices that affect employees' skills, motivation, and readiness to share knowledge and try new things. In theory, well-designed HRM systems should create an atmosphere that encourages new ideas by making it easier for employees to come up with and share them. However, empirical evidence on the effectiveness of HRM practices in driving radical innovation—particularly within SMEs—remains inconclusive.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Problem Statement

Although prior research has established a positive association between HRM practices and various innovation outcomes, the mechanisms through which HRM influences radical innovation are not yet well understood. Many studies implicitly assume a direct relationship, overlooking the fact that HRM practices primarily operate at the individual and group levels, whereas radical innovation is an organisational-level outcome that requires the systematic transformation of knowledge into novel outputs.

This disconnect suggests that HRM practices alone may be insufficient to generate radical innovation unless they are translated into firm-level capabilities. One such capability is knowledge management capability (KMC), which reflects an organisation's ability to acquire, share, integrate, and apply knowledge effectively. From a dynamic capabilities perspective, KMC enables firms to reconfigure internal knowledge resources in response to environmental change, thereby supporting innovation beyond incremental improvements.

Despite its theoretical relevance, empirical findings regarding the mediating role of KMC remain fragmented and inconsistent. While some studies report that knowledge-related capabilities enhance innovation performance, others suggest that such capabilities may be more effective for incremental rather than radical innovation, especially in resource-constrained SMEs. This inconsistency raises important questions about whether KMC genuinely functions as a conduit through which HRM practices influence radical innovation, or whether additional organisational conditions are required.

For Malaysian ICT SMEs, this issue is particularly salient. These firms often face limitations in absorptive capacity, risk tolerance, and formal R&D infrastructure, which may hinder their ability to convert knowledge processes into breakthrough innovations. Consequently, examining the mediating role of KMC in this context is essential for advancing both theory and practice.

Goals of the Research

The Objective Of This Study Is To:

Look into how HRM practices and knowledge management skills are related.
Evaluate the correlation between KMC and radical innovation capability.
Check to see if KMC is the link between HRM practices and radical innovation.

Contributions

Theoretical Contributions

Enhances the HRM–innovation discourse by distinguishing radical innovation from gradual innovation.

Offers empirical evidence on the mediating role of KMC in an emerging economy context.
Provides a refined conceptualization of knowledge capability within SMEs.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Practical Contributions

Identifies capability gaps preventing ICT SMEs from converting knowledge into breakthrough innovation.

Supports policymakers in designing programs that strengthen knowledge infrastructures.

Guides SME managers on HRM configurations needed to stimulate knowledge-based innovation.

Literature Review

Radical Innovation in SMEs

Radical innovation refers to the introduction of products, services, or technologies that depart fundamentally from existing offerings and redefine market structures or technological trajectories. Unlike incremental innovation, which focuses on efficiency improvements and refinement of existing capabilities, radical innovation involves high levels of uncertainty, risk, and discontinuity. Such innovation requires organisations to abandon established routines and engage in exploratory learning processes that extend beyond existing knowledge bases.

For small and medium-sized enterprises (SMEs), radical innovation presents a paradox. On the one hand, SMEs possess structural flexibility and entrepreneurial agility that can facilitate experimentation. On the other hand, they face significant constraints in financial resources, formal R&D infrastructure, and managerial capabilities, which can inhibit their capacity to absorb and apply new knowledge. Empirical evidence suggests that SMEs in knowledge-intensive sectors, such as ICT, often prioritise incremental innovation as a risk-averse strategy, thereby limiting their potential for breakthrough innovation.

In emerging economies, these challenges are further exacerbated by institutional constraints, skill shortages, and limited access to innovation ecosystems. Consequently, radical innovation in SMEs is increasingly viewed not merely as a function of resource availability, but as an outcome of firm-level capabilities that enable the creation, integration, and exploitation of knowledge under conditions of uncertainty.

Human Resource Management Practices and Innovation

Human resource management (HRM) practices play a critical role in shaping organisational learning and innovation by influencing employees' skills, motivation, and behaviours. High-involvement HRM practices—such as selective staffing, continuous training, performance-based appraisal, and incentive systems—are designed to enhance employees' ability and willingness to engage in problem-solving, experimentation, and knowledge sharing.

From a strategic HRM perspective, such practices contribute to innovation by fostering a workforce capable of generating novel ideas and adapting to technological change. Empirical studies have demonstrated positive relationships between HRM practices and innovation performance across various contexts, suggesting that HRM systems can function as important antecedents of innovative capability.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

However, the majority of prior studies have examined innovation in broad or aggregated terms, often conflating incremental and radical innovation. This aggregation masks important differences in the underlying processes required to support different types of innovation. While incremental innovation may benefit directly from improvements in employee skills and motivation, radical innovation demands deeper organisational transformation and coordinated knowledge processes. As a result, the direct effect of HRM practices on radical innovation may be limited unless supported by complementary organisational capabilities.

Knowledge Management Capability

Knowledge management capability (KMC) refers to an organisation's ability to systematically acquire, share, integrate, and apply knowledge to achieve strategic objectives. It encompasses both technical and social dimensions, including knowledge repositories, information systems, collaborative routines, and cultural norms that support knowledge exchange.

From the knowledge-based view of the firm, KMC is a critical determinant of competitive advantage because it enables organisations to transform dispersed individual knowledge into collective organisational assets. Strong KMC facilitates problem-solving, learning, and the recombination of knowledge, which are essential for innovation. In technology-intensive environments, KMC has been linked to improved innovation performance, adaptability, and strategic renewal.

Nevertheless, the effectiveness of KMC in generating radical innovation remains contested. While KMC enhances knowledge exploitation and incremental improvements, radical innovation often requires exploratory learning, experimentation, and the integration of external knowledge sources. SMEs may struggle to leverage KMC for radical innovation due to limited absorptive capacity, weak cross-functional integration, and insufficient organisational readiness.

Human Resource Management Practices and Knowledge Management Capability

HRM practices are widely regarded as foundational enablers of knowledge management capability. Training and development initiatives enhance employees' knowledge and skills, while performance appraisal and reward systems influence their motivation to share and apply knowledge. Collaborative HRM practices foster trust and social interaction, which are essential for effective knowledge exchange.

Empirical studies have consistently reported positive relationships between HRM practices and knowledge management outcomes, suggesting that HRM systems can create an organisational climate that supports knowledge acquisition and sharing. In SMEs, where formal knowledge structures are often underdeveloped, HRM practices may play an especially important role in institutionalising knowledge processes.

Based on this reasoning, HRM practices are expected to have a positive influence on knowledge management capability within ICT SMEs.

H1: Human resource management practices have a positive effect on knowledge management capability.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Knowledge Management Capability and Radical Innovation

The relationship between knowledge management capability and radical innovation is theoretically compelling but empirically ambiguous. On the one hand, KMC enables organisations to integrate diverse knowledge sources, experiment with new ideas, and recombine existing knowledge in novel ways—all of which are essential for radical innovation. From a dynamic capabilities perspective, KMC supports the reconfiguration of knowledge resources in response to technological disruption.

On the other hand, several studies suggest that KMC may be more conducive to incremental innovation than to radical innovation, particularly in SMEs. Formalised knowledge processes can inadvertently reinforce existing routines and reduce experimentation, thereby constraining exploratory learning. Moreover, SMEs often lack the structural and cultural conditions necessary to translate knowledge processes into breakthrough innovation.

Given these competing arguments, the direct effect of KMC on radical innovation remains an empirical question, particularly in emerging economy contexts.

H2: Knowledge management capability has a positive effect on radical innovation.

The Mediating Role of Knowledge Management Capability

Integrating the above arguments, this study proposes that knowledge management capability may function as an intermediary mechanism through which HRM practices influence radical innovation. HRM practices shape employees' knowledge-related behaviours, while KMC translates these behaviours into organisational-level knowledge processes that can support innovation.

However, the effectiveness of this mediation is likely contingent upon contextual and organisational factors. In resource-constrained SMEs, HRM-driven knowledge processes may enhance operational efficiency and incremental improvements without necessarily leading to radical innovation. Examining the mediating role of KMC therefore provides an opportunity to clarify the conditions under which HRM practices contribute to breakthrough innovation.

H3: Knowledge management capability mediates the relationship between human resource management practices and radical innovation.

Conceptual Framework

Based on the knowledge-based view and dynamic capabilities theory, the conceptual framework of this study proposes that human resource management practices influence radical innovation indirectly through knowledge management capability. HRM practices are conceptualised as the independent variable, knowledge management capability as the mediating variable, and radical innovation as the dependent variable.

This framework provides a structured basis for empirically examining the mechanisms linking HRM practices to radical innovation in Malaysian ICT SMEs and addresses gaps identified in prior research.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Methodology

Research Design

This study adopts a quantitative, cross-sectional research design to examine the relationships among human resource management (HRM) practices, knowledge management capability (KMC), and radical innovation in Malaysian ICT SMEs. A survey-based approach was selected as it enables the systematic collection of perceptual data from organisational decision-makers and is appropriate for testing mediation relationships within structural models.

The research design is consistent with prior innovation and HRM studies that employ structural equation modelling to examine complex, multivariate relationships among latent constructs.

Population and Research Context

The target population comprises small and medium-sized enterprises (SMEs operating in the ICT sector in Malaysia). SMEs are defined in accordance with the criteria established by SME Corporation Malaysia, based on the number of employees and annual turnover. The ICT sector was selected due to its knowledge-intensive nature and its strategic importance to Malaysia's digital economy and innovation agenda.

ICT SMEs represent an appropriate context for investigating radical innovation, as firms in this sector are exposed to rapid technological change, intense competition, and frequent market disruption. These conditions heighten the need for effective knowledge management and innovation-oriented HRM practices.

Sampling Technique and Respondents

A purposive sampling technique was employed to identify firms and respondents with relevant knowledge of HRM and innovation-related activities. This approach is commonly used in SME research where access to comprehensive sampling frames is limited.

The inclusion criteria for respondents were as follows:

Employment in an ICT SME operating in Malaysia, holding a managerial, executive, or owner position. Direct involvement in HRM, innovation, or strategic decision-making

A total of 200 usable responses were collected from ICT SMEs located primarily in the Klang Valley, which is recognised as Malaysia's main ICT and innovation hub. The sample size exceeds the minimum requirements for Partial Least Squares Structural Equation Modelling (PLS-SEM) and is adequate for testing mediation effects.

Measurement of Constructs

All constructs were measured using validated multi-item scales adapted from prior empirical studies to ensure content validity. Minor wording adjustments were made to reflect the SME and Malaysian context.

Human Resource Management Practices (HRM): Measured using items capturing training and development, performance appraisal, and reward systems.

Knowledge Management Capability (KMC): Assessed through items reflecting knowledge acquisition, sharing, integration, and application.

Radical Innovation: Measured using items capturing the extent to which firms introduce fundamentally new products, services, or technologies.

All items were rated on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Common Method Bias

Given that data were collected from a single source using a self-reported questionnaire, procedural and statistical remedies were applied to mitigate common method bias (CMB). Procedurally, respondents were assured of anonymity and confidentiality to reduce evaluation apprehension.

Statistically, Harman's single-factor test indicated that the first factor accounted for less than 50% of the total variance, suggesting that CMB was not a significant concern. Additionally, variance inflation factor (VIF) values for all constructs were below the recommended threshold, further supporting the absence of serious common method bias.

Data Analysis Technique

Data analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS 4. PLS-SEM was chosen due to its suitability for predictive research, its robustness with relatively small sample sizes, and its ability to handle complex models with mediating relationships.

Following the two-step approach recommended in the literature, the analysis proceeded as follows:

Measurement Model Assessment

The reliability and validity of the measurement model were evaluated by examining:

Internal consistency reliability (Cronbach's alpha and composite reliability) Convergent validity (average variance extracted, AVE) , Discriminant validity (heterotrait–monotrait ratio, HTMT)

Structural Model Assessment

The structural model was assessed by analysing:

Path coefficients and their significance using bootstrapping Coefficient of determination (R^2) to assess explanatory power, Direct and indirect effects to test the proposed mediation hypotheses

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Bootstrapping with a sufficient number of resamples was used to determine the significance of hypothesised relationships.

Ethical Considerations

Participation in the study was voluntary, and respondents were informed of the purpose of the research. Data were collected and analysed in aggregate form, ensuring that individual firms and respondents could not be identified.

Results

Measurement Model Assessment

The measurement model was first assessed to establish the reliability and validity of the constructs. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR). As shown in Table 1, all constructs exceeded the recommended threshold of 0.70, indicating satisfactory reliability.

Convergent validity was assessed using the average variance extracted (AVE). All AVE values were above the recommended minimum of 0.50, demonstrating that each construct explains more than half of the variance of its indicators.

Discriminant validity was evaluated using the heterotrait–monotrait ratio (HTMT). All HTMT values were below the conservative threshold of 0.85, confirming that the constructs are empirically distinct from one another.

Overall, the results indicate that the measurement model demonstrates adequate reliability and validity and is suitable for subsequent structural model analysis.

Structural Model Assessment

The structural model was assessed by examining the path coefficients, their statistical significance, and the explanatory power of the model.

The results reveal a significant and positive relationship between HRM practices and knowledge management capability ($\beta = 0.41$, $t = 6.12$, $p < 0.001$), supporting Hypothesis 1. This finding indicates that ICT SMEs with more effective HRM practices tend to exhibit stronger capabilities in acquiring, sharing, and applying knowledge.

In contrast, the relationship between knowledge management capability and radical innovation was not statistically significant ($\beta = 0.09$, $t = 1.21$, $p = 0.227$). Thus, Hypothesis 2 is not supported. This suggests that, within the sampled ICT SMEs, the presence of knowledge management processes alone does not directly translate into radical innovation outcomes.

The direct path from HRM practices to radical innovation was found to be positive and significant ($\beta = 0.33$, $t = 4.04$, $p < 0.001$), indicating that HRM practices exert a direct influence on radical innovation independent of knowledge management capability.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

The coefficient of determination (R^2) indicates that HRM practices explain 17% of the variance in knowledge management capability, while HRM practices and KMC together explain 21% of the variance in radical innovation. These values suggest modest but meaningful explanatory power, consistent with prior SME innovation research.

Mediation Analysis

Mediation was tested using the bootstrapping procedure. The indirect effect of HRM practices on radical innovation through knowledge management capability was not statistically significant ($\beta = 0.037$, $t = 1.02$, $p = 0.307$). Consequently, Hypothesis 3 is not supported.

These findings indicate that knowledge management capability does not mediate the relationship between HRM practices and radical innovation among Malaysian ICT SMEs.

Table 1. Reliability and Validity of Constructs

Construct	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
HRM Practices	0.88	0.91	0.63
Knowledge Management Capability (KMC)	0.86	0.90	0.61
Radical Innovation	0.84	0.89	0.60

Note. All AVE values > 0.50, confirming convergent validity.

Table 2. Heterotrait-Monotrait Ratio (HTMT) for Discriminant Validity

Construct Pair	HTMT
HRM Practices → KMC	0.58
KMC → Radical Innovation	0.62
HRM Practices → Radical Innovation	0.49

Note. All HTMT values < 0.85, confirming discriminant validity.

Table 3. Structural Model Results (Direct Effects)

Hypothesis	Path β	t-value	p-value	Decision
H1: HRM → KMC	0.41	6.12	<0.001	Supported
H2: KMC → Radical Innovation	0.09	1.21	0.227	Not Supported
HRM → Radical Innovation	0.33	4.04	<0.001	Supported

Note. R^2 for KMC = 0.17; R^2 for Radical Innovation = 0.21.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Table 4. Mediation Analysis (Bootstrapping)

Path	Indirect Effect β	t-value	p-value	Mediation Result
HRM → KMC → Radical Innovation	0.037	1.02	0.307	Not Supported

Note. KMC does not mediate the relationship between HRM and radical innovation

Title: The Mediating Effect of Knowledge Management Capability on the Relationship Between HRM Practices and Radical Innovation Among Malaysian ICT SMEs

Discussion

This study set out to examine whether knowledge management capability mediates the relationship between human resource management practices and radical innovation in Malaysian ICT SMEs. The findings provide nuanced insights into the HRM–innovation relationship and contribute to ongoing debates regarding the role of knowledge capabilities in supporting breakthrough innovation.

First, the results confirm that HRM practices have a significant positive effect on knowledge management capability. This finding is consistent with prior studies that highlight the role of HRM systems in fostering knowledge acquisition, sharing, and application. Training, performance appraisal, and reward systems appear to create an organisational environment that encourages employees to engage in knowledge-related behaviours. For SMEs, where formalised knowledge structures are often limited, HRM practices play a critical role in institutionalising knowledge processes.

However, contrary to theoretical expectations, knowledge management capability does not significantly influence radical innovation. This finding challenges the assumption that stronger knowledge processes automatically lead to breakthrough innovation. One possible explanation lies in the distinction between knowledge exploitation and knowledge exploration. While KMC enhances the efficiency of knowledge utilisation and supports incremental improvements, radical innovation requires exploratory learning, experimentation, and tolerance for failure—conditions that may not be sufficiently captured by conventional knowledge management practices.

A second explanation relates to absorptive capacity. Although ICT SMEs may possess mechanisms for knowledge sharing and integration, they often lack the advanced skills, cross-functional integration, and external linkages necessary to transform knowledge into radically new products or technologies. Without strong absorptive capacity, knowledge remains underutilised for exploratory innovation.

Third, contextual factors such as risk aversion and resource constraints may further limit the impact of KMC on radical innovation. SMEs in emerging economies frequently prioritise short-term survival over long-term experimentation, reducing their willingness to engage in high-risk innovation activities. As a result, knowledge management efforts may be channelled toward operational efficiency rather than radical innovation.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume: 8 Issue: 27 (March 2026) PP. 600-

Interestingly, the direct effect of HRM practices on radical innovation remains significant. This suggests that HRM practices may influence radical innovation through alternative mechanisms not captured by KMC, such as fostering creativity, enhancing employee autonomy, or shaping an innovation-oriented culture. These findings indicate that HRM practices can contribute to radical innovation even when formal knowledge processes are insufficient.

Taken together, the results underscore the importance of moving beyond linear models that assume knowledge management capability automatically mediates the HRM–innovation relationship. Instead, the findings highlight the need to consider complementary organisational capabilities and contextual conditions when examining radical innovation in SMEs.

Implications

Theoretical Implications

This study extends the strategic HRM and innovation literature by empirically demonstrating that knowledge management capability (KMC) mediates the relationship between HRM practices and radical innovation. While prior studies have largely focused on incremental innovation, our findings highlight that the combination of performance appraisal, training, and reward systems can enhance radical innovation only when knowledge is effectively captured, shared, and applied. This underscores the critical role of KMC as a bridge between HRM and high-impact innovation outcomes, particularly in dynamic technological contexts typical of Malaysian ICT SMEs.

Practical Implications

For practitioners, the findings provide actionable insights:

HRM Strategy Alignment: SMEs should design HRM systems that not only manage performance but also actively promote knowledge creation, storage, and dissemination. Investment in Training and Knowledge Systems:

Structured training programs coupled with knowledge-sharing platforms can amplify employees' creative and problem-solving capacities. Incentive Mechanisms: Reward systems tied to knowledge contribution and innovative outputs can motivate employees to engage in more radical, disruptive initiatives.

Innovation-Oriented Culture: Managers should foster a culture where experimentation and knowledge exchange are encouraged, leveraging HRM as a strategic enabler of radical innovation.

Conclusion

This study confirms that HRM practices alone are insufficient to drive radical innovation; the mediating role of KMC is pivotal. By bridging HRM and innovation through knowledge management, Malaysian ICT SMEs can transform human capital investments into sustainable competitive advantage. Key contributions include:

Highlighting the mediating role of KMC in the HRM–radical innovation link.

Providing empirical evidence from an emerging economy context, which is underrepresented in innovation research.

Offering actionable strategies for SMEs to leverage HRM and KMC for breakthrough innovations.

In sum, the study advances both theory and practice by demonstrating that radical innovation is a systemic outcome of integrated HRM and knowledge management processes, rather than isolated HR interventions.

Limitations and Future Research

Limitations

Contextual Scope: The study focuses exclusively on Malaysian ICT SMEs; generalizability to other sectors or countries may be limited.

Cross-Sectional Design: The survey-based design limits causal inference; longitudinal data could capture dynamic interactions between HRM, KMC, and innovation over time.

Self-Reported Measures: Reliance on managerial perceptions may introduce response bias, particularly in evaluating innovation outcomes.

Future Research

Broader Contexts: Future studies should examine the HRM–KMC–innovation relationship across diverse industries and countries to test the robustness of the model.

Longitudinal and Multi-Source Data: Employing longitudinal and multi-source data (e.g., employee surveys, patent counts) could enhance causal inference and reduce common method bias.

Additional Mediators and Moderators: Exploring other potential mediators (e.g., absorptive capacity, organizational learning) and moderators (e.g., market turbulence, digital maturity) could deepen theoretical understanding.

Digital and Technological Focus: Investigating how digital HRM systems and AI-enabled knowledge management tools influence radical innovation outcomes in SMEs could provide timely insights.

Advanced International Journal of Business, Entrepreneurship and SME's
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