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Leveraging human capital for product innovation: The mediating role of online presence among micro and small enterprises in a developing economy

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Abstract: This study investigates the role of human capital and online presence in driving product innovation among Micro and Small Enterprises (MSEs) in Pekanbaru City, Indonesia, a developing urban area with increasing digital adoption. Grounded in the Resource-Based View (RBV), the research explores how internal capabilities, particularly employee knowledge and skills, interact with digital resources to enhance innovation outcomes. A quantitative, cross-sectional design was employed using primary data collected via structured questionnaires distributed to MSE owners and managers across various processing sectors. Structural Equation Modeling (SEM-PLS) was used for data analysis. The findings reveal that human capital has a strong, positive influence on product innovation, while online presence also contributes positively, albeit to a lesser extent. Additionally, online presence partially mediates the relationship between human capital and innovation outcomes, indicating that digital tools enhance the transformation of internal competencies into market-relevant products. These results underscore the importance of integrating human resource development with digital strategies to boost innovation capacity in MSEs. This study contributes to the RBV literature by highlighting the complementary role of online presence in maximizing the value of human capital within innovation processes, particularly in developing country contexts.

Keywords: *Human capital, MSEs, Online presence, Product innovation.*

1. Introduction

The development of Small and Medium Enterprises (SMEs) plays a vital role in driving economic growth and fostering innovation, particularly in developing countries such as Indonesia, where firms operate under resource constraints and complex business environments [1, 2]. Conditions such as the digital divide, limited workforce capabilities, and the imperative for technology-driven business transformation present key challenges in enhancing SME performance [3-5]. These factors constitute a critical foundation for examining product innovation in SMEs within developing contexts, including Indonesia, which is currently undergoing accelerated digitalization and experiencing growth in its MSME-driven economy.

Product innovation in SMEs can be influenced by a variety of factors [6]. Among the most prominent in this context are human capital and online presence [7]. On one hand, human capital, which encompasses employees' skills, knowledge, and adaptive capabilities, plays a critical role in driving the creation and implementation of innovative ideas [5]. According to Silva-Atencio [4], strengthening human capacity is a key prerequisite for SMEs to compete innovatively in dynamic markets. On the other hand, online presence enables SMEs to reach broader customer bases, access new markets, and leverage digital technologies in product development [3]. Nevertheless, empirical research that comprehensively

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investigates how these two factors jointly influence product innovation in SMEs, particularly in the Indonesian context, remains limited.

Online presence has been recognized as a critical factor in driving product innovation among Small and Medium Enterprises (SMEs), especially in developing countries undergoing accelerated digital transformation [3, 7]. An established digital presence enables SMEs to expand market reach, build direct interactions with customers, and access new sources of information and technology that support innovation processes [8]. However, there remains a significant gap in the literature regarding the role of online presence as an intervening variable in the relationship between human capital and product innovation. Most previous studies have predominantly focused on the direct relationship between online presence and product innovation [9, 10] or have examined human capital and innovation separately [4, 5]. Comprehensive research that integrates all three variables, human capital, online presence, and product innovation, remains scarce. Therefore, it is essential to further investigate how online presence may function as a strategic bridge that amplifies the contribution of human capital to innovation, particularly in the context of SMEs in developing economies.

This potential interaction has become particularly salient in the current context, as online presence has emerged as a strategic asset for Micro and Small Enterprises (MSEs) in developing countries, offering substantial benefits such as expanded market access, enhanced customer engagement, and the facilitation of real-time information flows [3, 8]. Accordingly, this study seeks to address this gap by posing the following research question: Can online presence mediate the relationship between human capital and product innovation in MSEs?

The empirical investigation was conducted in Pekanbaru City, Indonesia, a developing urban area with significant economic potential that faces substantial challenges in the digital transformation of its Micro and Small Enterprises (MSE) sector. According to Raharja et al. [11], only 25.92% of MSE actors in Pekanbaru have integrated e-commerce into their business operations, reflecting a low level of digital adoption despite the city's strategic position as a commercial hub and its abundance of natural resources. Nevertheless, Pekanbaru remains underexplored in academic literature, despite offering a unique context for understanding MSE innovation in emerging urban markets. At the national level, MSEs play a critical role in supporting Indonesia's economic competitiveness. Data from BPS Provinsi Riau [12] indicate that MSEs comprise more than 26 million enterprises, accounting for approximately 98.68% of all non-agricultural businesses, and employ over 59 million people, or 75.33% of the non-agricultural workforce. These figures highlight the importance of digital innovation in promoting inclusive and sustainable economic development, both in Indonesia and in other developing countries.

This paper offers two primary contributions to the innovation literature. First, it provides empirical evidence on the mediating role of online presence in the relationship between human capital and product innovation among MSEs operating in a developing economy. The findings offer new insights, indicating that online presence not only has a direct impact on innovation but also enhances the influence of human capital in fostering innovative products. Second, the study encourages practitioners to recognize the strategic importance of integrating online presence with human capital development to produce market-responsive product innovations.

The structure of the paper is organized as follows: Section two discusses the theoretical framework and formulates the research hypotheses. Section three outlines the research methodology. Section four presents the findings and data analysis. Finally, Section five concludes the main results, addresses research limitations, and proposes future research directions.

2. Literature Review

The theoretical foundation of this study is the Resource-Based View (RBV) of the firm, which posits that companies acquire or develop specific resources and capabilities that interact with existing ones to enhance competitiveness and ultimately achieve superior performance [13-15]. The RBV has been widely applied in product innovation research [16], where success largely depends on a firm's ability to manage a bundle of resources to differentiate its products from competitors [14].

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In the context of this study, human capital represents a critical capability for many Micro and Small Enterprises (MSEs), as it reflects the knowledge, skills, and competencies of the workforce in absorbing and implementing new ideas [4]. On the other hand, online presence is regarded as a strategic digital resource that enables firms to connect with markets, expand customer reach, and access relevant information for innovation [17].

From the RBV perspective, a synergy between capabilities (human capital) and resources (online presence) occurs when a firm effectively integrates both to create a competitive advantage that is difficult for rivals to imitate [13, 14]. For instance, MSEs with digitally literate employees can leverage their online presence to gather customer information through strategically designed digital communication patterns. These patterns, which reflect the firm's internal capabilities, may generate valuable market insights and support a sustainable innovation process.

2.1. Human Capital and Product Innovation in SMEs

Theoretically, human capital can contribute to product innovation in SMEs by enhancing knowledge management capabilities throughout the innovation process. Specifically, human capital supports the generation, analysis, and implementation of new ideas, enabling SMEs to identify, understand, and respond to market needs and preferences through developing new products or modifying existing ones [2]. This view is consistent with the argument that employees' knowledge, skills, and competencies play a central role in driving innovative processes within dynamic business environments [4]. As noted by Lukhmanov and Tsakalerou [5], firms with strong human capital are better equipped to absorb external information and translate it into innovation activities that are aligned with customer needs. Wojtaszek et al. [18] further emphasize that a shortage of skilled labor often constitutes a major barrier to achieving innovative outcomes, particularly among SMEs in developing economies.

Empirical evidence supports the relationship between human capital and innovation in SMEs. Asad et al. [2] find that knowledge management capabilities, underpinned by effective human resource development, exert a significant influence on the success of product innovation. Similarly, Silva-Atencio [4] demonstrates that in regions characterized by institutional constraints, such as Latin America, strengthening human capital remains a key determinant of innovation-based competitiveness. Nevertheless, it is important to acknowledge that not all SMEs are able to effectively convert human capital into innovation outcomes in the absence of appropriate organizational structures and strategic support.

Despite these contextual limitations, drawing on the theoretical and empirical evidence discussed above [2, 4, 5], we therefore propose the following hypothesis:

H_1: Human capital has a positive effect on product innovation in SMEs.

2.2. Online Presence and Product Innovation in SMEs

Theoretically, online presence has emerged as a strategic enabler of product innovation in SMEs, particularly in developing countries where digital technologies serve as accessible tools to overcome traditional resource constraints [3, 7]. By leveraging digital platforms, SMEs can enhance knowledge acquisition, strengthen customer engagement, and accelerate the processes of creating and launching innovative products. These digital interactions allow firms to gather real-time customer feedback, identify unmet market needs, and test product designs with greater agility [17].

Empirical studies support the positive relationship between digitalization and innovation outcomes. For example, Wojtaszek et al. [18] demonstrate that SMEs adopting digital tools are more capable of addressing innovation barriers such as limited market access and skilled labor shortages. Similarly, León-Gómez et al. [19] found that online presence significantly enhances product development processes among SMEs in Spain. In Thailand, Ueasangkomsate [7] shows that digital transformation, driven by IT competencies and online engagement, directly supports the development of new products and ultimately improves firm competitiveness.

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Nevertheless, some scholars, such as Di Pietro et al. [20], caution that the adoption of information and communication technologies does not universally lead to positive outcomes. The success of digital strategies heavily depends on how effectively these tools are integrated into innovation-related activities. Therefore, although much of the literature affirms the relevance of online presence to innovation, contextual factors and the quality of implementation play critical roles.

Based on the theoretical foundation and supporting empirical evidence, we propose the following hypothesis:

H_2. Online presence has a positive effect on product innovation in SMEs.

2.3. Human Capital, Online Presence, and Product Innovation in SMEs

Theoretically, human capital is regarded as a primary driver of product innovation, particularly among small and medium-sized enterprises (SMEs) operating in developing countries. Human capital refers to the stock of skills, knowledge, and capabilities possessed by employees, which enables firms to generate and implement new ideas. However, the influence of human capital on innovation is not always direct. Recent studies highlight the importance of digital tools, especially online presence, in assisting firms to translate internal competencies into tangible innovation outcomes [4, 7].

Specifically, online presence allows SMEs to leverage human capital more effectively by facilitating real-time communication with customers, collecting market feedback, and testing new product concepts within digital environments [3]. As noted by Dhewanto et al. [8], digital channels function not only as marketing instruments but also as strategic platforms for knowledge exchange and innovation experimentation. In this regard, online presence acts as a bridge between internal capabilities and external innovation activities.

Empirical evidence indicates that firms with strong human capital are better positioned to utilize digital tools to enhance product innovation [18]. Nevertheless, the mediating role of online presence in the relationship between human capital and product innovation remains underexplored in the literature. While prior studies have examined the impact of human capital on innovation [5] or the effect of digital presence on firm performance [17], only limited research has integrated these three variables within a single comprehensive framework.

Accordingly, grounded in the theoretical perspective of the Resource-Based View [13, 14] and supported by the aforementioned empirical findings, this study proposes the following hypothesis:

H_3. Online presence mediates the relationship between human capital and product innovation in SMEs.

Figure 1 illustrates the proposed research model, depicting the direct effect of human capital on product innovation as well as the mediating role of online presence.

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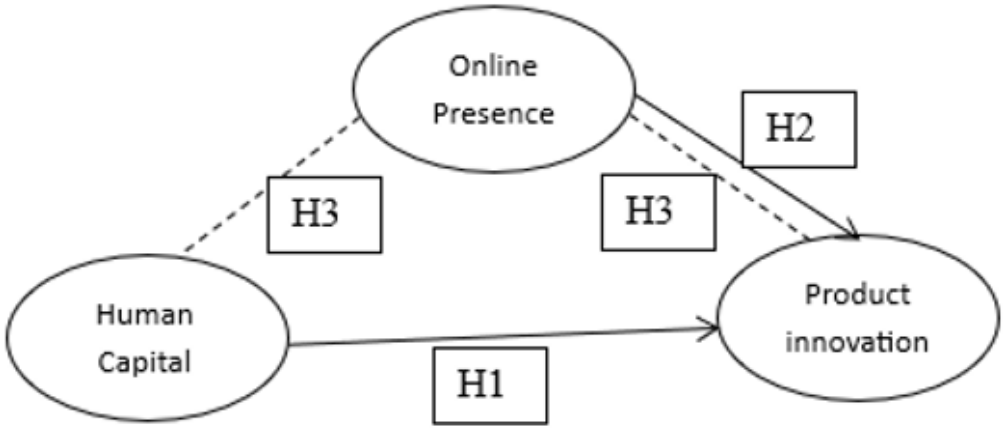

Figure 1.
Research model.

3. Method

3.1. Research Design

This study adopts a non-experimental, cross-sectional, and quantitative research design to examine the extent to which online presence mediates the relationship between human capital and product innovation among Micro and Small Enterprises (MSEs). Primary data were collected through a structured questionnaire administered to owners or managers of MSEs operating in Pekanbaru City. This location was selected due to its status as an emerging urban area with a high level of digital adoption, particularly in the utilization of e-commerce, and substantial economic potential. These characteristics position Pekanbaru as a relevant setting to investigate the interplay between human capital, online presence, and product innovation within the context of MSEs in developing countries.

Data collection was conducted between August and October 2025 using a structured questionnaire employing a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire items were adapted from previously validated studies [21] and contextualized to align with the local MSE environment. A pilot test involving 20 MSEs was carried out to refine the wording and ensure clarity of the instrument. The questionnaire also captured respondents' sociodemographic characteristics, including gender, age, education, ownership status, annual sales, business age, and business legality.

4. Result

The characteristics of respondents in this study reflect the profile of Micro and Small Enterprises (MSEs) operating in the processing sector in Pekanbaru City. The respondents represent seven main sub-sectors with a relatively balanced distribution: trade (14.3%), services (14.3%), food and beverage processing (14.3%), handicrafts (14.3%), agriculture (14.3%), plantations (14.3%), and forestry (14.2%). This composition highlights the diversity of economic activities among MSEs in this emerging urban area.

Most respondents are male, indicating the continued predominance of men in the ownership and management of MSEs within the processing sector. In terms of age distribution, the majority of business actors are between 26 and 35 years old, followed by those aged 36 to 45, reflecting the involvement of a productive age group in business development. Regarding educational background, most respondents are high school graduates; however, a considerable proportion hold diplomas and bachelor's degrees, indicating a growing level of human capital among MSE owners.

The majority of surveyed enterprises have been operating for three to five years, with a substantial number categorized as new businesses (less than three years), and a smaller portion having operated for over ten years. In terms of assets, most MSEs report asset values ranging from IDR 1 to 5 billion,

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classifying them as small enterprises, while a smaller number fall under the microenterprise category with assets below IDR 1 billion. Regarding annual turnover, most businesses generate less than IDR 2 billion, which aligns with the national definition of MSEs. The number of employees typically ranges between 5 and 19 persons, with only a few enterprises employing more than 20 workers, reinforcing their classification as micro and small enterprises.

Table 1.
Measurement Model Assessment: Outer Loadings, AVE, Cronbach's Alpha, and Composite Reliability.

Variable	Indicator	Outer Loading	AVE	Cronbach's Alpha	Composite Reliability
Human capital	HC1	0.830	0.656	0.912	0.930
	HC2	0.766			
	HC3	0.881			
	HC4	0.850			
	HC5	0.826			
	HC6	0.684			
	HC7	0.815			
Online Presence	OP1	0.895	0.758	0.893	0.926
	OP2	0.913			
	OP3	0.772			
	OP4	0.894			
Product	P1	0.675	0.513	0.893	0.913
	P2	0.667			
	P3	0.776			
	P4	0.756			
	P5	0.803			
	P6	0.652			
	P7	0.662			
	P8	0.769			
	P9	0.695			
	P10	0.687			

The table demonstrates that the three constructs in this study, Human Capital, Online Presence, and Product Innovation, exhibit satisfactory levels of validity and reliability. All Average Variance Extracted (AVE) values exceed the recommended threshold of 0.5, indicating adequate convergent validity. Furthermore, Cronbach's Alpha and Composite Reliability values for all constructs are above 0.7, reflecting strong internal consistency and construct reliability. Although several indicators within the Product Innovation construct show outer loading values slightly below 0.7, these indicators were retained because the AVE and composite reliability values remain acceptable, consistent with the recommendations of Hair et al. [22] for PLS-SEM analysis.

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Table 2.
Cross Loading.

	Human Capital	Online Presence	Product Innovation
HC1	0.830	0.301	0.632
HC2	0.766	0.214	0.578
HC3	0.881	0.283	0.679
HC4	0.850	0.194	0.656
HC5	0.826	0.183	0.632
HC6	0.684	0.150	0.485
HC8	0.815	0.231	0.668
OP1	0.274	0.895	0.386
OP2	0.282	0.913	0.453
OP3	0.210	0.772	0.297
OP4	0.187	0.894	0.351
P1	0.422	0.246	0.675
P10	0.543	0.278	0.667
P2	0.650	0.294	0.776
P3	0.572	0.385	0.756
P4	0.645	0.350	0.803
P5	0.473	0.435	0.652
P6	0.516	0.284	0.662
P7	0.577	0.281	0.769
P8	0.547	0.178	0.695
P9	0.506	0.360	0.687

The cross-loading table indicates that each indicator exhibits the highest loading on its respective construct, demonstrating satisfactory discriminant validity. Indicators of Human Capital (HC1–HC8) show higher loadings on the Human Capital construct compared to Online Presence and Product Innovation. A similar pattern is observed for the indicators of Online Presence (OP1–OP4) and Product Innovation (P1–P10), which display the highest loadings on their respective constructs. This confirms that each indicator specifically measures its intended construct and clearly distinguishes itself from the others. These results support the discriminant validity among constructs within the research model.

Table 3.
Standardized Root Mean Square Residual (SRMR).

SMRM	Conclusion
0.067	Model Fit

The Standardized Root Mean Square Residual (SRMR) value is 0.067 (< 0.08), indicating a good model fit. Therefore, the model is deemed suitable for hypothesis testing. The following presents the R-squared table.

Table 4.
R-square.

Endogen Variables	R-Square
Online Presence	0.077
Product Innovation	0.643

The R-Square table indicates that the Online Presence variable has a value of 0.077, reflecting a low (weak) contribution from the exogenous construct in explaining the variance in online presence among micro and small enterprises (MSEs). In contrast, the Product Innovation variable shows an R-Square value of 0.643, suggesting that the model explains 64.3% of the variance in product innovation, which is categorized as strong. These findings affirm that while the model is effective in explaining product innovation, its explanatory power regarding online presence remains limited and warrants further improvement. Figure 2 illustrates the outcomes of the structural model.

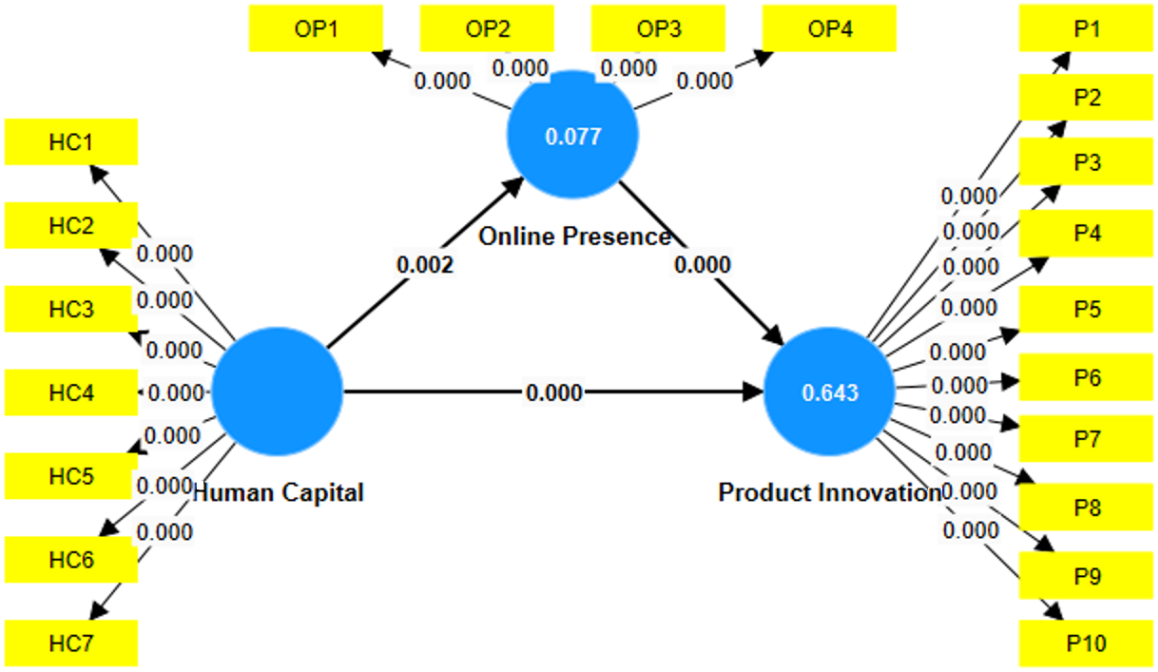

Figure 2.
The outcomes of the structural model.

Based on the structural (inner) model presented in Figure 2, which includes the corresponding path coefficients and t-statistics, the findings from the hypothesis testing are summarized in Table 5.

Table 5.
Structural Model Results and Hypothesis Testing.

Hypotesis	Relationship	Original Sample	t-statistics	p-value	description
H1	Human Capital -> Product Innovation	0.702	12.747	0.000	Positive (Significant)
H2	Online Presence -> Product Innovation	0.239	3.713	0.000	Positive (Significant)

The results of the hypothesis testing indicate that Human Capital has a positive and significant effect on Product Innovation, with an original sample value of 0.702, a t-statistic of 12.747, and a p-value of 0.000 (H1). This finding suggests that improving the quality of human resources substantially enhances the product innovation capabilities of micro and small enterprises (MSEs). Additionally, Online Presence also demonstrates a positive and significant effect on Product Innovation, with an original sample value of 0.239, a t-statistic of 3.713, and a p-value of 0.000 (H2). These results imply that online presence plays an important role in fostering innovative activities, although its contribution is relatively lower compared to that of human capital. Overall, both exogenous variables have a significant role in explaining product innovation in the context of MSEs in developing countries.

Table 6.
Indirect effect.

Hypotesis	Relationship	Original Sample	t-statistics	p-value	description
H3	Human Capital -> Online Presence -> Product Innovation	0.066	2.510	0.012	Positive (significant)

The results of the mediation path analysis indicate that Online Presence positively and significantly mediates the relationship between Human Capital and Product Innovation, with an original sample value

of 0.066, a t-statistic of 2.510, and a p-value of 0.012 (H3). This finding suggests that online presence functions as a transmission mechanism that strengthens the contribution of human capital to product innovation. Although the observed mediating effect is partial and relatively modest in magnitude, its statistical significance underscores the importance of digital strategies as a critical bridge between internal capabilities and innovative outputs in the context of micro and small enterprises in developing countries.

5. Discussion

Human capital has been identified as one of the key strategic resources that plays a central role in driving product innovation, particularly within the Micro, Small, and Medium Enterprises (MSMEs) sector in developing countries. From the perspective of the Resource-Based View (RBV), internal capabilities such as knowledge, skills, and employee experience significantly contribute to sustained innovative processes [13, 14]. Several empirical studies have confirmed the positive relationship between human capital and product innovation. For example, Wojtaszek et al. [18] revealed that the lack of skilled labor is one of the main barriers to innovation among manufacturing SMEs, emphasizing the importance of human resource quality in strengthening innovation capabilities. Additionally, Asad et al. [2] demonstrated that knowledge management rooted in human capital serves as a key mediating factor in enhancing product innovation, ultimately contributing to improved business performance. Similarly, Silva-Atencio [4] emphasized that the targeted development of human capital can overcome institutional and cultural barriers and facilitate innovation adoption even within constrained market environments. These consistent empirical findings reinforce the argument that human capital has a positive impact on product innovation and provide a theoretical foundation for designing competitiveness-enhancing strategies through investments in human resource development.

Theoretically, online presence also plays a critical role in enhancing the innovative capacity of MSMEs, particularly in developing economies. Digital engagement enables firms to access market information in real-time, establish direct interaction with customers, and accelerate the absorption and dissemination of knowledge relevant to new product development. This aligns with Arvanitis and Loukis [23], who argue that online platforms support the identification of customer needs and the formulation of innovative ideas based on digital communication. Furthermore, Valdez-Juárez et al. [24] emphasized that online presence significantly contributes to knowledge acquisition and its application in innovative production processes.

Empirical evidence further substantiates these claims. A study by Pérez-de-Lema et al. [10] involving 1,201 companies in Colombia found that investments in digital presence had a positive impact on product innovation among MSMEs. Similar findings were reported by León-Gómez et al. [19] in Spain. Ueasangkomsate [7] also highlighted that digitalization and IT competency significantly supported new product development in Thailand's MSME food sector. In the Indonesian context, Dhewanto et al. [8] emphasized the importance of the quadruple helix approach in supporting digital transformation and achieving international product quality through stakeholder collaboration. On the other hand, although not all combinations of digital technologies yield direct innovation outcomes [25], available evidence suggests that a strategically managed online presence can enhance decision-making and accelerate product innovation [9].

In the context of micro and small enterprises (MSEs) in developing countries, human capital has a significant influence on product innovation, particularly when facilitated by online presence as a strategic intervening variable. Human capital, including employees' knowledge, skills, and experience, plays a crucial role in supporting idea generation and knowledge-based decision-making [2, 5]. However, the direct impact of human capital on innovation may not be fully realized without the effective use of digital technologies that enable broader market interaction and real-time customer insights. In this regard, online presence serves as a vital channel through which internal capabilities can be translated into market-relevant value Ueasangkomsate [7]. Silva-Atencio [4] further highlighted that focused human capital development, when supported by adaptive digital media, can overcome structural limitations within local

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innovation systems. Hence, the synergy between human capital and online presence enhances the innovative capacity of MSEs by fostering the development of more adaptive and competitive products. These findings reinforce the theoretical foundation of the Resource-Based View (RBV), which emphasizes the importance of integrating internal resources with digital platforms to achieve sustainable competitive advantage.

6. Conclusion

This study aimed to examine the influence of human capital and online presence on product innovation among Micro and Small Enterprises (MSEs) in the context of a developing country. The findings reveal that human capital has a significant and positive effect on product innovation, while online presence also exerts a direct influence, although its contribution is comparatively lower. Furthermore, the analysis indicates that online presence serves as a significant mediating variable in the relationship between human capital and product innovation, albeit with a partial and relatively small effect. These results affirm that while internal capabilities such as knowledge and skills are critical for innovation, the integration of digital tools is equally essential to transform such capabilities into market-relevant outcomes. Therefore, MSEs should prioritize the development of human capital alongside the strategic utilization of digital platforms to enhance their innovative capacity. Theoretically, this study contributes to the Resource-Based View (RBV) framework by emphasizing the importance of integrating internal resources with digital infrastructure to build a sustainable competitive advantage. Nevertheless, the study is limited to the food and beverage sector in a single urban area. Future research is encouraged to expand its scope across different sectors, regions, and levels of digital maturity to generate more comprehensive insights into innovation dynamics within MSEs.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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