

DOI: <https://doi.org/10.63332/joph.v6i1.3858>

## The Interplay of Humans and Technology in Innovation: How Human Capital, Social Media, and Open Innovation Shape Innovation Performance in the Posthuman Era

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### Abstract

*This study explores the role of human capital, social media, and open innovation in shaping innovation performance among Minangkabau culinary entrepreneurs in West Sumatra. Using a qualitative approach through in-depth interviews and field observations across five regions, the study examines how traditional skills and experiential knowledge are transformed through digital technologies. The findings reveal that human capital serves as the primary driver of innovation, while social media mediates open innovation by enabling idea exchange, customer feedback, and network expansion. Human–technology interactions allow entrepreneurs to preserve cultural identity while enhancing market adaptability. This study contributes to the understanding of culturally embedded innovation in the posthuman era.*

**Keywords:** Human Resources; Social Media; Open Innovation; Minangkabau Cuisine; Post-Human Era.

### Introduction

The rapid development of information and communication technology, particularly social media and digital platforms, has eroded the traditional boundaries between humans and machines, resulting in conditions where human and non-human entities (technology, algorithms, digital networks) interact intensively in everyday life and in innovation practices. The posthumanist perspective offers a critical framework for understanding this transformation by rejecting the classical humanistic view that separates humans from technology, and asserting that humans are no longer the sole agents in the processes of creation, production, and innovation (post-anthropocentric). (Braidotti, 2013; Haraway, 1991; Herbrechter et al., 2022). Within this framework, the human subject is redefined as part of a human–technology hybrid network where agency, identity, and creativity emerge from the complex interrelationships between humans, digital media, and information systems (Latour, 2005).

Through social media, the open innovation process, as explained by H. Chesbrough (2006; H. W. Chesbrough, 2003), is becoming increasingly intense. Organizations can access external knowledge, crowdsourcing, and cross-platform collaboration that humans do not solely control, but also by digital systems. This interaction between human capital, the use of social media, and

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open innovation practices is what ultimately contributes to improved innovation performance (Calantone et al., 2002; Latifah et al., 2022). Thus, understanding the interconnectedness of humans and technology is crucial to explaining how the structure of innovation in the posthuman era is shaped not only by humans but by the reciprocal relationship between humans, technology, and digital networks. However, in the digital and posthuman era, human capital needs to be enhanced, not only the cognitive or physical abilities of individuals, but also the ability to utilize technology, interact in digital networks, and access knowledge and external resources through social media and bold platforms, thus emerging the concept of tech-augmented human capital.

Social media and digital networks are not merely communication tools; they serve as spaces for collaboration, knowledge exchange, creative networks, and the integration of non-human agents that enable the spread of ideas, co-creation, and innovation across geographic and institutional boundaries. Consequently, traditional closed innovation approaches are no longer adequate (Barrett et al., 2021; Bogers et al., 2019; Marques, 2014; West & Bogers, 2017). In contrast, the Open Innovation paradigm offers a collaborative and open framework in which organizations welcome ideas from outside, collaborate with consumers, digital communities, or other external parties, leveraging external knowledge as part of the innovation process (Chabbouh, 2020; H. Chesbrough, 2017; Latifah et al., 2022; Yulianti et al., 2024).

Recent empirical studies show that human capital and social media networking significantly influence innovation, and social media can mediate the relationship between human capital and open innovation (Latifah et al., 2022; Yulianti et al., 2024). These findings indicate that social media and digital networks not only support but also expand the innovative capabilities of both individuals and organizations, in line with the posthuman logic, where innovation agency is distributed between humans and technology.

The Minangkabau culinary industry is one of the most influential culinary traditions in Indonesia and Southeast Asia, marked by a vast diaspora and a well-established Padang restaurant system (Mardatillah, 2020; Sovia Firdaus et al., 2018). Minangkabau cuisine, such as rendang, gulai, dendeng batokok, and sate padang, is not only a gastronomic product but also a representation of identity, cultural values, and communal knowledge (Waryono, 2021). In the digital context, social media has become a new space for Minangkabau culinary practitioners to develop their creativity, share recipes, modify traditions, and create innovations through culinary crowdsourcing. Platforms such as Instagram, TikTok, and YouTube enable the transformation of Minangkabau culinary culture through intense human-technology interactions, where algorithms, visual content, and brave communities collectively become sources of inspiration for innovation. This phenomenon aligns with the posthumanist concept, which views innovation not only as a human activity but also as the result of the relationship between humans, technology, and digital networks (Braidotti, 2013; Ferrando, 2019). Therefore, Minangkabau culinary is an ideal context for understanding how human capital, social media, and open innovation shape innovation performance in the posthumanist era.

Although innovation literature has emphasized the importance of human capital and external collaboration, most research still takes a human-centric perspective. It has not integrated digital technology as an agent with agency in the innovation process. Open innovation studies rarely adopt a posthumanist approach that views social media, algorithms, and platforms as non-human

entities that influence innovation dynamics (Braidotti, 2013; Haraway, 1991; Herbrechter et al., 2022). Furthermore, there has been no empirical research specifically examining the relationship between human capital, social media, and open innovation in the context of Minangkabau culinary culture. This ecosystem relies heavily on the combination of tradition, diaspora, and digitalization. This gap underlies the importance of this research. Therefore, this article aims to examine how human-technology linkages (through technology-enhanced human resources and social media) contribute to open innovation practices, and how they collectively influence innovation performance, particularly in the Minangkabau culinary industry, which is rich in cultural heritage. This approach presents a new perspective: not only traditional innovation management, but also innovation studies grounded in posthumanism, human-technology networks, and the transformation of local culture through technology.

## **Literature review**

Previous research in the field of human resources and industry indicates that the understanding of the forms of human capital that encourage knowledge exchange remains limited (Annamalah et al., 2023). Ghazilla in Sudarnice et al. (2024) emphasizes that the weak innovation performance of MSMEs is caused by inadequate human capital, a workforce that is less responsive and less ready to adapt, and a lack of internal training, which makes it difficult for companies to respond to market changes. Studies on the relationship between human capital and innovation have been reviewed (Sudarnice et al., 2024). However, in the context of Minangkabau culinary in West Sumatra, the problems that arise are more complex, especially regarding skills, knowledge, and the quality of human resources which have a direct impact on the ability to innovate (Lita Prima et al., 2020).

Many Minangkabau culinary delights still rely on traditional production methods and minimal training, hampering product creativity and readiness to meet dynamic market needs. Human capital, as part of intellectual capital, has been shown to increase innovation (Ali et al., 2021; Chabbouh & Boujelbene, 2020; Fonseca et al., 2019; Latifah et al., 2022), although some studies have found no significant relationship (Capozza & Divella, 2019). Furthermore, the low awareness among Minangkabau culinary actors of the importance of sharing knowledge exacerbates the weakness of collaboration and business networks (Mardiah et al., 2024). In contrast, knowledge sharing is an important component in supporting open innovation (Engelsberger et al., 2022).

In Minangkabau culinary culture in West Sumatra, obstacles such as limited social networks, resistance to change, a lack of trust between employees, and a collectivist culture that tends to stifle individual initiative are real barriers to sharing knowledge (Games et al., 2022; Games & Rendi, 2019). This situation is becoming increasingly challenging due to the rapidly changing business environment and unequal access to information and technology. On the other hand, Indonesia holds enormous potential through its cultural diversity as a source of industrial creativity (Eni et al., 2022; Sanusi & Paramida, 2021), including in West Sumatra, where the people have a strong entrepreneurial tradition (Lita Prima et al., 2020) but still tied to traditional leadership patterns and work culture (Semiarty & Fanany, 2017). A weak innovation culture also reduces the performance of the innovation industry (Lita et al., 2018), while the ability to adopt open innovation greatly influences the readiness of organizational culture (Bogers et al., 2016;

In the digital era, the use of social media has become a crucial element, as it can expand knowledge networks, facilitate market access, and foster innovation and collaboration (Benitez et al., 2018; Ooms et al., 2015). However, Minangkabau culinary actors in West Sumatra have not utilized the platform optimally and tend to waste time without an effective business strategy (padang.go.id, 2024; Yulianti et al., 2024). Therefore, this study is important to fill the literature by examining how human capital influences innovation performance through social media networks, knowledge sharing, and open innovation as intervention mechanisms, especially in the context of Minangkabau culinary in developing countries that face technological capability challenges but have a high intensity of social media use (Latifah et al., 2022).

To clarify the conceptual linkages between human capital, social media, open innovation, and the Minangkabau culinary context, a visual representation is necessary to depict the logistical flow of relationships between these variables. This mapping demonstrates how human resources, as knowledge assets, transform through social and technological mechanisms, particularly the use of social media, and flow into open innovation processes, ultimately contributing to improved innovation performance. This structure also reflects how all these dynamics operate contextually within the Minangkabau culinary ecosystem, which is rich in cultural values and adaptable to technological developments.

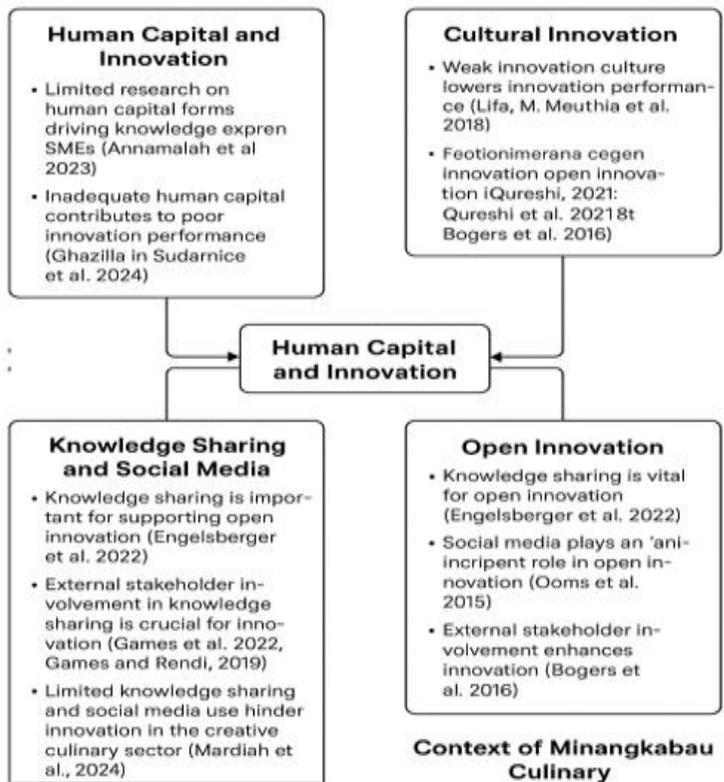


Figure 1. Conceptual Flow of Human–Technology Interactions in the Innovation Process: The Role of Human Capital, Social Media, and Open Innovation

The diagram illustrates that human capital serves as the primary foundation for the formation of knowledge and innovative capabilities. When this knowledge is reinforced by social media-based activities such as information sharing, trend observation, and digital networking, the flow of innovation becomes more open and collaborative. This flow is particularly relevant to the Minangkabau culinary industry, where recipe creativity, flavor adaptation, and cultural narratives often develop through digital interactions between industry players. Thus, the flowchart not only illustrates the theoretical relationships between variables but also illustrates how humans, technology, and culture are embodied in concrete innovation practices that influence culinary business performance in the posthuman era.

## **Methodology**

### **Design:**

This research employs a qualitative approach with an exploratory study design to gain a deeper understanding of how human capital, social media usage, and open innovation practices contribute to innovation performance in the Minangkabau culinary industry. A qualitative approach was chosen because it enables researchers to explore the experiences, meanings, and perspectives of industry players who are directly involved in interacting with the production process, digital technology, and daily business practices. In accordance with Creswell's (2014) presentation, qualitative research provides a space to capture the complexities of social and cultural contexts that cannot be fully explained through quantitative approaches.

### **Population and Sample:**

This research was conducted in five central Minangkabau culinary areas: Tanah Datar, Payakumbuh, Padang, Sijunjung, and Sawahlunto, selected because each represents the diverse characteristics of the culinary industry in West Sumatra. Respondents were selected purposively, specifically owners and managers of Minangkabau culinary industries directly involved in production, marketing, and operational decision-making, who held a minimum of a bachelor's degree and had an industry history of more than 5 years. These criteria ensured that each respondent had relevant experience and information related to human capital, social media use, innovation processes, and the dynamics of human-technology relationships in their business environment.

### **Data collection**

Data collection was conducted through in-depth interviews, direct observation, and participant reflections. The interviews were semi-structured to allow respondents the freedom to share their experiences while maintaining focus within the research framework. Observations included production activities, service interactions, social media usage, and emerging collaboration patterns at the industrial site. These observations allowed researchers to directly observe innovation practices and technology integration, rather than relying solely on participant narratives.

## **In-depth Interviews with Sources from the Minangkabau Culinary Industry**

In-depth interviews with Minangkabau culinary industry players in five regions: Tanah Datar, Payakumbuh, Padang, Sijunjung, and Sawahlunto, show that human capital in the traditional culinary sector is undergoing significant transformation due to the presence of digital technology. Industry owners and managers explained that culinary expertise and traditional skills are no longer the only core competencies, as they are now required to master digital skills such as social media management, product photography, communication skills, and analysis of insights features on Instagram or ordering apps. They mentioned that employees and family members involved not only work in the kitchen but also carry out digital functions integrated with daily business operations. This illustrates that human capital in the Minangkabau culinary sector has transformed into a hybrid skill set that combines traditional skills and digital technology.

Social media has emerged as one of the most important sources of innovation for industry players. They claim to gain menu inspiration, packaging references, and understanding consumer trends through platforms like TikTok, Instagram, and YouTube. One industry player in Tanah Datar described social media as a "new teacher" that opened their horizons to previously unimaginable flavor and presentation innovations. The innovation process is also enriched by observing global culinary content, which they then adapt to the Minangkabau context without losing its traditional values. Thus, social media plays a role not only as a promotional tool but also as a cognitive partner that expands imagination, accelerates the creative process, and encourages continuous experimentation.

Furthermore, interviews revealed that open innovation has become a common practice among Minangkabau culinary industry players. Many of them participated in in-person and face-to-face training on digital marketing, packaging techniques, operational management, and collaboration between industries held by communities, government agencies, or business institutions. Industry players acknowledged that product and service innovations often emerge from collaboration, the exchange of ideas, and learning through the industry. They defined innovation as a social process that transcends network ties, not just individual initiatives. This finding confirms that external knowledge flows are a crucial part of the innovation process in the traditional culinary sector, so that innovation institutions no longer reside solely with individuals but are also distributed through digital networks and external institutions.

Interviews also revealed significant changes in how industry players understand customers. They stated that Instagram Insights, Customer Comments, and Direct Messages (DMs) help them read trends more accurately. Some industry players described them as "digital sensors" that allow them to detect the popularity of specific menu items, the most effective selling times, or customer response to innovations. They believe that technology provides them with market insights that they previously relied solely on intuition. As a result, decision-making regarding product innovation, flavor variations, and marketing strategies is now more responsive, measurable, and data-driven.

Ultimately, the integration of human capital and technology has been proven to improve the innovation performance of Minangkabau culinary industry players. Innovation emerges not only

from menu development but also through digital-based services such as pre-order systems, sales through delivery platforms, digital payment methods, and modern, more durable packaging. Industry players believe that innovation now means not only creativity in cooking but also the ability to manage technology to create added value for customers. Industry players' narratives indicate that they now operate in a posthuman ecosystem, where human creativity, social media algorithms, digital devices, and external networks interact simultaneously to shape their innovation processes and industry performance.

## Field Survey Results

A field survey conducted among Minangkabau culinary industry players in five regions: Padang, Tanah Datar, Payakumbuh, Sijunjung, and Sawahlunto, revealed consistent patterns related to human capital dynamics, social media utilization, open innovation practices, and innovation performance in the traditional culinary sector. The survey was completed by industry owners and managers directly involved in production and marketing, providing a factual picture of the industry's condition and the challenges they face. This is summarized in the table below:

Main Theme	Description
Human Capital Conditions in Minangkabau Culinary MSMEs	This theme examines the quality of technical skills, managerial capabilities, and the readiness of industry players to face industry change. Findings indicate that traditional skills still dominate human capital, lacking integration of modern knowledge.
Utilization of Social Media for Business Activities	This theme explores how industry players utilize social media for marketing, customer communication, and gathering market information. While routine, its use is not yet strategic.
Open Innovation Practices in the Culinary Industry	These themes include collaboration patterns, external learning activities, and external knowledge sources such as communities, government, and informal training. Open innovation practices often occur intuitively, rather than systematically.
Culture of Innovation and Resistance to Change	This theme explores the dynamics of innovation culture, the role of traditional Minangkabau values, an orientation towards authenticity, and resistance to product modification. Local culture influences the speed of innovation.
Variation in Innovation Performance Between Regions	This theme illustrates how geographic context and digital infrastructure influence innovation performance across the five survey areas. Large cities are more adaptable than suburban and rural areas.
Digital Transition of the Minangkabau Culinary Ecosystem	This theme examines the conditions under which MSMEs transition from traditional to digital-based systems, external collaboration, and technology-driven innovation.
Human-Technology Relations in the Development of the Culinary Industry (Posthumanism Theme)	A new theme depicts the integration of technology (social media, digital insights, payment apps, delivery platforms) as “non-human actors” that shape innovation practices, decision-making, and industry-customer relationships. This unifies the human-technology dimension as a unified ecosystem.
The Impact of Human-	This theme highlights how technology is no longer just a tool, but

Technology Interaction on Open Innovation and Performance	a cognitive partner that shapes behavior, information perception, and the pace of innovation. Industry players learn, experiment, and create value through continuous interaction with digital technology.
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Table 1. Field Survey Results

As part of an analysis of human-technology relations in the context of the Minangkabau culinary industry, this study identifies significant changes before and after the integration of digital technology. These transformations are summarized in the following table, illustrating how human interactions, technology, and industrial practices have evolved in the digital and posthuman eras.

Aspect	Before Technology Integration (Pre-Digital / Low-Tech)	After Technology Integration (Human-Technology Interaction / Posthumanist Lens)
Access to Recipe Information & Culinary Knowledge	Knowledge is passed down orally within families, limited to local experiences.	Technology (YouTube, Instagram, TikTok, Google) opens up access to cross-cultural learning, expands recipe improvisation, and enriches cooking techniques.
Media Promotion	Relying on word of mouth, local customers, and traditional social connections.	Social media has become a primary marketing channel; algorithms help expand market reach nationally and globally.
Industry Player-Customer Relationship	Direct face-to-face interaction fosters trust through social proximity.	Digital interactions, such as chat, comments, ratings, and reviews, build trust in online reputation, not just personal proximity.
Industrial Decision Making	Decisions based on intuition, inherited experience, and local demand patterns.	Social media analytics, sales insights, and customer data form the basis for fast, accurate, and more adaptive decisions.
Culinary Innovation Process	Innovation is relatively slow; the focus is on traditional recipes, with changes following local customs.	Technology accelerates product innovation, packaging, services, and creative collaboration through digital trends and open innovation.
Human Capital	Competence is limited to traditional skills (cooking, serving, selling).	Developing human capital includes digital literacy, content creation, platform management, and technology-based innovation.
Marketing & Market Reach	The market is limited to the surrounding area (village, city).	The market expanded drastically through e-commerce, as well as culinary exports facilitated by national delivery services like

		GoFood and GrabFood.
Operational Industry	Manual, relying entirely on human labor, and simple record keeping.	Technology integration: digital POS, automated record-keeping system, modern production machines, app-based stock management.
Human–Technology Coupling	Technology does not become part of the industry's identity; humans remain at the center of operations.	A human–technology symbiosis emerges: technology becomes an extension of human capacity, according to the posthumanist framework (co-agency).
Open Source Innovation	Limited collaboration and information sharing between industry players is rare.	Social media facilitates both inbound (ideas from customers/competitors) and outbound (sharing recipes, content, and techniques) open innovation.
Local Branding & Identity	Branding based on regional origin and authentic taste.	Minang cultural narratives are reframed through digital visuals (storytelling, videos, aesthetic photos), strengthening identity in the digital space.
Adaptation Level	Slow; takes time to adapt to changing market tastes.	Fast; Industry players respond to viral trends, algorithms, and digital insights in real-time.

Table 2. Transformation of Human–Technology Relations in the Minangkabau Culinary Industry

## Results

Based on an in-depth analysis of interviews with Minangkabau culinary industry players spread across five central regions: Tanah Datar, Payakumbuh, Padang, Sijunjung, and Sawahlunto, several important patterns were found that illustrate the changing human-technology relationship, the dynamics of open innovation, and the role of human capital in shaping innovation performance in the digital era. The following findings show how the production, marketing, and strategy processes of the Minangkabau culinary industry are evolving from traditional practices to co-evolutionary human-technology interactions, in accordance with the posthumanist perspective. The following are the main points of this research.

1. Human capital remains the primary foundation of innovation, but it is now enhanced by technology. Industry players emphasize that basic skills (cooking, serving, and maintaining flavor) remain the core of success. However, digital competencies (photo editing, content creation, trend analysis, and app use) are now part of modern human capital. Technology does not replace traditional skills; instead, it expands human capacity to create value.

2. The integration of digital technology is transforming the way the Minangkabau culinary industry learns, adapts, and innovates. New recipes, cooking techniques, and even packaging ideas are often discovered on social media platforms like TikTok, Instagram, and YouTube. Industry players refer to technology as an "additional teacher," in line with the principle of posthumanism (technology as a cognitive partner). Industry adaptation is faster because players can follow viral trends in real time.
3. Social media serves as a space for human-technology interaction that fosters open innovation. Product ideas often emerge from customer comments, influencer content, or observations of competitor trends. Industry players embrace inbound open innovation (external inspiration) and simultaneously share outbound open innovation (recipe content, cooking processes). Digital marketplaces create community-based open innovation ecosystems.
4. Minangkabau cultural identity is reproduced and renegotiated through technology. Industry players use cultural narratives (randang, Katupek, and Minang gulai) as visual representations of their identity. Photos, videos, and digital storytelling help reinforce the authentic image of Minangkabau in the eyes of non-local consumers. Technology becomes a tool for preservation—not a threat—due to the breadth of cultural values.
5. Human-customer interactions have expanded from physical spaces to digital ones. Relationships once built through social proximity are now strengthened through digital reviews, ratings, and testimonials. New customers are predominantly those who learn about the industry through social media content, rather than in-person visits. This creates a new form of trust-building based on digital reputation.
6. Human-technology partnerships create a form of "dual agency" in innovation. Industry players often describe technology as a "market understanding tool". Social media algorithms play a significant role in determining viral content, posting times, and visibility. This suggests technology is not passive, but co-shapes innovation decisions and outcomes, a core perspective in posthumanism theory.
7. Despite the dominance of technology, traditional values, tastes, and Minangkabau identity remain intact. Industry players emphasize that innovation is driven by methods and appearance, rather than the essence of tradition. This demonstrates a hybridity: tradition is maintained; technology reinforces traditional values. Tradition and technology work in harmony, not replacing each other.

## **Discussion**

The results of this study suggest that human capital plays a crucial role in driving open innovation within the Minangkabau culinary industry. This finding is consistent with human capital theory, which emphasizes the importance of knowledge, skills, and experience in creating innovative capabilities (Latifah et al., 2022; Mardatillah, 2020; Waryono, 2021; Yulianti et al., 2024). In the context of Minangkabau culinary arts, traditional competencies passed down through generations are transformed into modern capacities when combined with the use of social media (Yulianti et

al., 2024). Social media serves not only as a communication tool but also as a collaborative space where industry players can obtain relevant ideas, feedback, and trends. This strengthens social media's position as a mediator that bridges human capabilities with open innovation processes, both inbound and outbound. Furthermore, the finding that Minangkabau culinary identity remains intact amidst digitalization suggests that innovation does not replace tradition, but instead expands how it is maintained and marketed. Therefore, this study enriches the literature on open innovation in the context of local culture-based culinary SMEs.

### **Research Limitations and Implications**

This study has several limitations. First, the data were obtained through in-depth interviews with culinary industry players in five regions of West Sumatra; therefore, the findings may not represent the full range of Minangkabau culinary practices in other regions. Second, the study focused only on industries that were already using social media, so the prospects of industry players who were not yet digital may have been overlooked. Third, the qualitative nature of the study limits the statistical generalizability of the findings. Nevertheless, this study offers important implications for academics and practitioners. For researchers, this study provides an opportunity to develop quantitative empirical models of the relationship between human capital, social media, and open innovation in the culture-based culinary sector. For industry players, the results suggest that enhancing individual competencies and strategically leveraging social media can enhance innovation capabilities. Local governments can also utilize these findings to design digital training, strengthen Minangkabau culinary branding, and incubate innovation programs based on local wisdom.

### **Conclusion**

This study concludes that human capital is the primary driver of open innovation in the Minangkabau culinary industry, and social media plays a crucial role as a mediator strengthening this relationship. Traditional competencies possessed by industry players develop into innovative capacities when combined with digital practices, enabling the generation of new ideas from customers, suppliers, communities, and networks. The findings also confirm that innovation is carried out without eliminating the cultural identity of Minangkabau culinary; instead, technology helps expand reach and accelerate the process of market adaptation. Overall, this study provides theoretical and practical contributions by demonstrating how the combination of people, culture, and technology can produce a relevant and sustainable open innovation process in the traditional culinary sector.

### **Disclosure Statement**

The authors declare that they have no potential conflicts of interest.

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