# THE ROLE OF ICT ADOPTION AND OPEN INNOVATION IN AFFECTING BUSINESS RESILIENCE IN FOOD AND BEVERAGE MSMEs IN BANDAR LAMPUNG

**(Undergraduate Thesis)**

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# ABSTRAK

## PERAN ADOPSI TIK DAN INOVASI TERBUKA DALAM MEMENGARUHI KETAHANAN BISNIS PADA UMKM MAKANAN DAN MINUMAN DI BANDAR LAMPUNG.

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UMKM memiliki peran vital bagi ekonomi Indonesia, namun sektor makanan dan minuman seringkali sulit mempertahankan ketahanan bisnis di tengah ketidakpastian pasar. Penelitian ini menganalisis pengaruh adopsi Teknologi Informasi dan Komunikasi (TIK) serta inovasi terbuka terhadap ketahanan bisnis UMKM di Bandar Lampung. Menggunakan pendekatan kuantitatif, data primer dari 112 responden dianalisis dengan regresi linear berganda. Hasil penelitian memberikan bukti empiris bahwa adopsi TIK berpengaruh positif dan signifikan terhadap ketahanan bisnis. Begitu pula dengan inovasi terbuka yang terbukti berpengaruh positif dan signifikan terhadap ketahanan bisnis. Temuan ini mengonfirmasi bahwa kedua hipotesis penelitian ($H_1$ dan $H_2$) didukung sepenuhnya. Hal ini menunjukkan bahwa integrasi digital dan kolaborasi eksternal merupakan kunci keberlangsungan UMKM. Penelitian ini merekomendasikan agar pemilik UMKM memprioritaskan transformasi digital pada sistem informasi dan melakukan inovasi berbasis pelanggan. Selain itu, pemerintah daerah perlu memfasilitasi program literasi digital dan platform kolaborasi untuk mendukung pertumbuhan UMKM.

**Kata Kunci: Adopsi TIK, Inovasi Terbuka, Ketahanan Bisnis**

## ABSTRACT

# THE ROLE OF ICT ADOPTION AND OPEN INNOVATION IN AFFECTING BUSINESS RESILIENCE IN FOOD AND BEVERAGE MSMEs IN BANDAR LAMPUNG

***By:***

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*Micro, Small, and Medium Enterprises (MSMEs) are vital to Indonesia's economic growth, yet many in the food and beverage sector struggle to maintain resilience amid market uncertainty. This study analyzes the impact of Information and Communication Technology (ICT) adoption and open innovation on MSME business resilience in Bandar Lampung. Using a quantitative approach, primary data from 112 respondents were analyzed through multiple linear regression. The results provide empirical evidence that ICT adoption has a positive and significant effect on business resilience. Similarly, open innovation also significantly enhances business resilience. These findings confirm that both research hypotheses ($H_1$ and $H_2$) are fully supported. Consequently, digital integration and external collaboration are essential for MSME survival. The study recommends that MSME owners prioritize digital transformation in supply chain systems and engage in customer-driven innovation. Additionally, local governments should provide digital literacy programs and collaborative platforms to support MSME growth.*

***Keywords: ICT adoption, open innovation, business resilience***

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I hereby declare that this research is entirely my own work, and that this thesis does not contain, either in whole or in part, the work of others that has been taken by copying or imitating in the form of sentences or symbols representing ideas or opinions from other research without proper acknowledgment of the original author. Should this declaration be proven untrue in the future, I am willing to accept any sanctions or penalties in accordance with the applicable regulations.

Bandar Lampung, 12 Februari 2026


Arif Rahmansyah

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# BIOGRAPHY

The author, Arif Rahmansyah, was born in Bandar Lampung on August 12, 2003, to Mr. Suhendarsyah and Mrs. Elinda. The author is the youngest of four siblings and currently resides in Way Halim, Bandar Lampung. The author began his educational journey at SD Al-Azhar 1, graduating in 2015. He continued his studies at MTSN 2 Bandar Lampung, completing junior high school in 2018, and later pursued his senior high school education at SMA IT Riyadhussholihiin, where he graduated in 2022. In 2022, the author enrolled at the University of Lampung (Unila) to pursue a Bachelor's degree, majoring in Management (International Class) within the Faculty of Economics and Business, with a specific concentration in Entrepreneurship.

During his time at university, the author has been actively engaged in both academic and professional development. He has gained valuable practical experience through internship programs at PTPN I regional 7, which have bolstered his professional competencies. In 2025, he further demonstrated his commitment to community development by participating in the Community Service Program (KKN) in Bukit Kemuning, North Lampung. In addition to his academic and professional pursuits, the author is actively involved in campus organizations. His membership in the AIESEC in Unila and ROIS FEB Unila reflects his dedication to organizational growth, leadership, and active contribution to his academic community.

# MOTTO

**“In the middle of difficulty lies opportunity”**

**(Albert Einstein)**

## DEDICATION

*Bismillahirrahmanirrahim.*

All praise and sincere gratitude belong to Allah Subhanahu wa Ta'ala, and may peace and blessings be upon Prophet Muhammad SAW. Through His infinite love, mercy, and countless blessings that provided guidance, strength, and ease at every stage of this journey, this thesis has been successfully completed.

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Arif Rahmansyah

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# I. INTRODUCTION

## 1.1 Background

Micro, Small, and Medium Enterprises (MSMEs) are widely acknowledged as a key driver of economic development, particularly in developing countries. In Indonesia, MSMEs are defined as productive business units that are operated by individuals or legal entities and fulfil specific criteria based on asset ownership and annual income. This definition is formally established in Law No. 20 of 2008 concerning MSMEs, which classifies them into three categories: micro, small, and medium enterprises (Shaid and Pratama, 2022). According to Law Number 20 of 2008 concerning MSMEs, while grouping based on the number of employees involved in a business is not formulated in the law. The criteria for MSMEs determined based on the assets and revenue owned can be seen in Table 1.1.

**Table 1.1 Criteria of MSMEs according to Law No. 20 2008**

| No. | Enterprises | Criteria | |
|---|---|---|---|
| | | Asset (Rp.) | Revenue (Rp.) |
| 1. | Micro Enterprises | Max 50 million | Max 300 million |
| 2. | Small Entreprises | > 50 - 500 million | > 300 million - 2.5 billion |
| 3. | Medium Enterprises | > 500 million - 10 billion | > 2.5 billion - 50 billion |

Source: Dinas Koperasi dan Usaha Mikro Kabupaten Bojonegoro (n.d.)

These financial benchmarks serve as a legal basis for government assistance, policy planning, and the allocation of support programs for MSMEs.

In addition to legal classifications, Indonesia's Central Statistics Agency (Badan Pusat Statistik) further categorizes MSMEs based on the number of workers employed. This

labor-based classification complements the financial indicators by providing a broader understanding of business scale and capacity. Typically, MSMEs are closely linked to lower and middle-income communities and are deeply embedded in local economies, particularly in the trade, services, and manufacturing sectors (Shaid and Pratama, 2022). Their products and services are consistently in demand, which makes them resilient and relevant in meeting daily needs. The continuous demand for essential goods and services produced by MSMEs reflects their strong market potential and highlights their important social and economic role in serving communities with low purchasing power (H Sinaga et al., 2024).

The role of MSMEs extends beyond income generation. They are also vital in reducing unemployment, promoting equitable regional development, and fostering entrepreneurship at the grassroots level. MSMEs contribute significantly to Indonesia's economic growth, accounting for approximately 61 percent of the national Gross Domestic Product (GDP) and absorbing nearly 97 percent of the country's total workforce. With over 65 million active MSME units across the nation, they make up more than 99 percent of all existing businesses (Purnomo et al., 2024). As such, MSMEs form the backbone of Indonesia's economy and serve as the foundation for inclusive and sustainable development. According to Kumar et al. (2024), their involvement in production, distribution, and local service delivery enables them to close the development gap between rural and urban areas and to empower local communities through economic participation.

In the regional context, the city of Bandar Lampung plays a significant role in the development of MSMEs in Lampung Province. Based on data from 2020 to 2021, Bandar Lampung had the highest number of MSMEs in the province, with over 118,000 business units operating in various sectors. In 2024, the total number of food and beverage MSMEs in Bandar Lampung reached 1,183 (Badan Pusat Statistik Kota Bandar Lampung, 2025). This concentration of MSMEs highlights the city's strategic importance as a center for small business activities and as a potential engine of regional economic growth. Moreover, the presence of a large number of MSMEs in Bandar

Lampung contributes significantly to job creation and helps reduce the unemployment rate in the area (Murti, 2024).

Despite their critical economic contributions, many MSMEs continue to face persistent challenges that hinder their growth and performance. Among the most pressing issues are limited innovation capabilities and the low adoption of digital technologies. These limitations reduce their ability to respond to shifting consumer needs, technological trends, and competition from larger, more advanced enterprises. Judijanto et al. (2024) found that MSMEs often struggle to keep up with business modernization due to the lack of innovation infrastructure, access to skilled labor, and the capacity to develop new products or services. These challenges were further intensified by the COVID-19 pandemic, as many MSMEs struggled to retain sufficient cash flow and faced a sharp decline in consumer demand, which subsequently led to a decrease in overall business performance (Sudjatmoko et al., 2023). In the long run, companies may face significant challenges such as a drastic reduction in customer orders, increasing operational expenses including rent, salaries, and taxes, as well as rising raw material costs. Businesses may also struggle with weak market demand and limited access to alternative suppliers (Messabia et al., 2022). In response to these pressures, business owners and leaders are required to take proactive steps, remain informed about regulatory changes, maintain a balanced mindset, manage the overwhelming flow of information, and determine clear priorities in order to navigate the difficulties caused by the pandemic.

One major issue is the slow rate of digital transformation. According to the Ministry of Cooperatives and SMEs, by 2022 only 26.5 percent of MSMEs had begun utilizing digital platforms to conduct online sales, amounting to approximately 17.25 million business units (Anatan & Nur, 2024). This indicates that the majority of MSMEs have not yet integrated digital technology into their operations. The limited uptake of digital tools is largely attributed to low levels of digital literacy, limited internet access in some areas, insufficient infrastructure, and a general lack of readiness among business owners to implement change (Judijanto et al., 2024). Furthermore, Indonesia ranks

relatively low in the World Economic Forum's Network Readiness Index, which reflects a national digital gap and insufficient digital readiness to support a thriving digital economy (IMF, 2023). These findings demonstrate that without urgent attention, MSMEs risk falling further behind in the digital transformation era.

In response to these challenges, researchers and practitioners emphasize the importance of adopting Information and Communication Technology (ICT) to improve the overall performance of MSMEs. The integration of ICT as a strategic business tool allows these enterprises to enhance their competitiveness by leveraging the internet and digital platforms (Kumar et al., 2022). This enables MSMEs to compete more effectively, not only with local competitors but also with larger corporations on a global scale. ICT facilitates greater productivity and enables faster, more efficient customer interactions, providing MSMEs with access to broader markets. Furthermore, the implementation of ICT supports the smooth operation of business processes and opens up new opportunities for growth and expansion (Kumar et al., 2022). Erumban and Das (2016) argue that improving communication and coordination through ICT systems can significantly enhance organizational efficiency. As MSMEs increasingly shift away from traditional business models, the need for digital integration becomes more urgent. Nazir & Khan (2024) highlight that digital tools not only support basic business operations but are also critical for long-term competitiveness and sustainability in the digital age.

In addition to ICT, open innovation is another strategic factor that MSMEs can leverage to improve their adaptability and resilience. According to Rumanti et al. (2022), open innovation encourages collaboration with external partners, including universities, research institutions, other businesses, and even customers. It supports radical and incremental innovation, which is essential for MSMEs facing resource limitations. Londong et al. (2024) further explain that open innovation can influence consumer behavior through improved marketing strategies and product development. Hendrawan et al. (2024) emphasize that innovation is key for achieving a company's strategic objectives and responding effectively to external challenges. Lopes et al.

(2022) also stress that in the current era of globalization and rapid technological change, open innovation is not only beneficial but necessary for companies to survive and grow in a competitive environment.

Considering the strategic role of MSMEs in economic development and the serious challenges they face in digitalization and innovation, this study is considered timely and relevant. Previous studies have shown that ICT adoption improves internal efficiency and open innovation enhances adaptability and creativity. However, research that examines how these two variables work together to influence the business resilience of MSMEs is still limited, especially at the local level such as Bandar Lampung (Kumar et al., 2022). Bandar Lampung, as a city with a large number of active MSMEs, provides a meaningful setting to explore these issues. Therefore, this research aims to investigate the influence of ICT adoption and open innovation on the business resilience of food and beverage MSMEs in Bandar Lampung, which is considered one of the largest MSME industries in the city. The findings are expected to contribute both theoretically and practically by offering new insights for academic research and by informing policies and strategies that support MSME development in the digital economy.

## 1.2 Research Problem

Although MSMEs play a major role in supporting the Indonesian economy, especially in Bandar Lampung, many of them continue to face serious difficulties in maintaining their business performance and resilience. Among the key challenges are their limited ability to adopt digital technology and their low capacity for innovation (Judijanto et al., 2024). These two factors directly affect how MSMEs respond to market changes, address competition, and sustain operations in a fast-changing business environment. The food and beverage sector, which represents one of the most dominant and fast-growing MSME categories in Bandar Lampung, is particularly important to study. According to data, Bandar Lampung had 1,158 restaurants and food outlets by 2024, accounting for approximately 35.38% of all such establishments in Lampung Province

(Josua, 2025). Furthermore, small- and micro-scale food manufacturing businesses comprised around 35,792 units in the region and employed approximately 45% of the sector's workforce (Yuniarti et al., 2022). These figures indicate that the food and beverage sector holds strong potential in employment creation and economic contribution. However, despite its size and significance, many of these businesses still struggle to integrate technology into their operations and are not yet involved in innovation (Judijanto et al., 2024). While previous studies have shown that ICT adoption improves internal efficiency and open innovation enhances adaptability and creativity, there is still limited research that investigates how these two variables jointly influence the business resilience of MSMEs, particularly at the local level (Kumar et al., 2022). Therefore, this study focuses on examining how ICT adoption and open innovation affect the business resilience of food and beverage MSMEs in Bandar Lampung. To address the problems identified in the previous discussion, this study formulates the following research questions:

1. How does ICT adoption affect business resilience of Food and Beverage MSMEs in Bandar Lampung?
2. How does open innovation affect business resilience of Food and Beverage MSMEs in Bandar Lampung?

## 1.3 Research Objectives

**Research Objectives:**

1. To evaluate the relationship between ICT adoption on business resilience in Food and Beverage MSMEs in Bandar Lampung.
2. To analyze the impact of open innovation on business resilience in Food and Beverage MSMEs in Bandar Lampung.

## 1.4 Research Benefits

1. Theoretical Benefits

Theoretically, this research contributes to the development of knowledge in the areas of innovation management, digital transformation, and business resilience. By examining the relationship between ICT adoption, open innovation, and business resilience within the context of MSMEs food and beverage sector in Bandar Lampung, this study enriches existing academic literature with empirical findings from a developing country perspective. It provides context-specific insights that are valuable for researchers and academics seeking to understand how innovation and technology influence the sustainability of small businesses. Furthermore, this research can serve as a useful reference for future studies aiming to explore similar topics in different regions or expand the model with additional variables.

2. Practical Benefits

a. Impact on MSME

The findings of this study can help Food and Beverage MSMEs owners and managers better understand the importance of adopting digital technologies and engaging in open innovation to strengthen their business resilience. The research highlights practical strategies that MSMEs food and beverage sector can implement to enhance innovation capacity, adapt to market changes, and sustain operations in competitive and uncertain environments. Ultimately, this can support food and beverage MSMEs in improving their performance, expanding their market reach, and increasing long-term sustainability.

b. Impact on Government and Policymakers

This study provides valuable insights for policymakers in designing and implementing more targeted support programs for food and beverage MSMEs, particularly in digital transformation and innovation capacity building. The findings can inform the development of inclusive policies that encourage technology

adoption and collaborative innovation among small businesses. This is particularly useful for local governments like those in Bandar Lampung to align MSMEs food and beverage development with regional economic planning and digitalization goals.

# II. LITERATURE REVIEW

## 2.1 Information and Communication Technology (ICT) Adoption

Information and Communication Technologies (ICTs) encompass a broad spectrum of technological tools and resources specifically designed to facilitate communication, as well as to support the creation, dissemination, storage, and management of information. These technologies include devices such as computers, the internet, broadcasting media like radio and television, and telecommunication systems, including both fixed-line and mobile telephones. Importantly, ICTs are rarely used as isolated tools, instead, they are often implemented in an integrated manner to maximize their effectiveness in delivering information and services (Wang & Zhou, 2013). In the context of business, ICT has evolved beyond being merely a set of technological instruments to become a strategic asset that can offer organizations a wide range of advantages. These advantages include gaining access to broader markets, obtaining timely and accurate information, optimizing resource utilization, enhancing operational efficiency, and strengthening networking capabilities, all of which contribute to higher business performance and increased competitiveness (V. Kumar et al., 2022).

The concept of ICT adoption refers to the deliberate process through which Micro, Small, and Medium Enterprises (MSMEs) integrate technological solutions, such as digital devices, mobile phones, and network infrastructure, into their core operations. The fundamental objective of this adoption is to improve efficiency, boost productivity, enhance service delivery, increase market visibility, and facilitate an efficient and seamless flow of information within and beyond the organization (Kumar et al., 2024). Empirical research has consistently shown that adopting ICT can bring substantial benefits to MSMEs. For instance, Qalati et al. (2021) assert that the effective use of ICT enables small businesses to streamline operations, reduce costs, increase productivity, and improve connectivity with both suppliers and customers. These

improvements can create a significant competitive advantage, ultimately generating value for all stakeholders involved.

This perspective is reinforced by Kumar et al. (2024), who argue that MSMEs leveraging ICT are in a stronger position to expand their market reach, manage resources more efficiently, and ensure long-term business resilience in an environment characterized by rapid technological change and intense competition. Amid the rapid expansion of globalization and liberalization worldwide, information and communication technology (ICT) is widely regarded as a highly cost-effective instrument that enables firms to expand their market reach and strengthen their competitiveness. Through ICT, companies are better positioned to compete with larger organizations in promoting their products, services, and information to potential customers.

According to Tan et al. (2009), the adoption of ICT within the MSME sector is characterized by several key dimensions, beginning with cost efficiency which focuses on the reduction of operational and transaction costs, as well as communication reliability to ensure stable and fast information exchange. Furthermore, it involves coordination and partnership for better collaboration with external stakeholders, the creation of market opportunity to reach wider customer segments, and operational facilitation to streamline internal business processes. Therefore, a comprehensive understanding of these indicators in ICT adoption is crucial for developing practical strategies that can enhance organizational capabilities, improve competitiveness, and enable MSMEs to adapt successfully to the challenges and opportunities presented by the modern business landscape.

### 2.1.1 Dynamic Capabilities Theory

Dynamic Capabilities theory provides a crucial lens for understanding Information and Communication Technology adoption, emphasizing an organization's capacity to adapt and thrive in rapidly changing environments (Arifin & Frmanzah, 2015). Dynamic capabilities refer to a firm's ability to integrate, build, and reconfigure internal and external resources and competencies to address and shape dynamic business landscapes

(Teece, 2010). This theoretical perspective suggests that ICT adoption is not a static process, but rather an ongoing strategic endeavor that requires firms to continually renew their resources and align them with evolving external conditions (Arifin & Frmanzah, 2015).

Specifically, dynamic capabilities enable organizations to effectively manage technology adoption through processes such as sensing new opportunities, seizing them through strategic decisions, and transforming the organization to leverage these new technologies (Teece, 2010). Authors like Arifin suggest that technology adoption itself can be viewed as a functional capability that mediates the relationship between dynamic capabilities and a firm's performance (Arifin & Frmanzah, 2015). Therefore, organizations with strong dynamic capabilities are better equipped to adapt to turbulent industries and continuously reconfigure their technological assets to achieve competitive advantage and improved performance (Arifin & Frmanzah, 2015; (Teece, 2010).

## 2.2 Open Innovation

In today's dynamic business landscape, organizations are increasingly affected by external environmental factors beyond their control, which significantly shape their growth and development. This unpredictability creates substantial challenges, making it more difficult for companies to maintain consistent innovation. In response to these conditions, the concept of open innovation has gained growing significance as a comprehensive paradigm for fostering business development. Open innovation is a conceptual framework that enables MSMEs to benefit from innovation, both process and product innovation, through leveraging the intentional flow of knowledge in and out for fast-track innovation (Rumanti et al., 2023). Open innovation emphasizes that firms should not rely solely on internal resources in their Research and Development (R&D) processes. Instead, they should actively leverage external assets and knowledge to discover new solutions that can be implemented effectively, while also monetizing unused internal resources that might otherwise remain untapped. By embracing this

approach, companies can better adapt to market changes, enhance their innovative capacity, and strengthen their competitiveness in an increasingly uncertain environment (Lopes et al., 2022).

Open innovation encompasses the ability of a firm to enhance its innovative capacity through active interaction and collaboration with other organizations, including partners, suppliers, customers, and even competitors (Greco et al., 2016). This approach moves beyond the traditional notion that innovation must be generated solely within a company's internal boundaries, instead recognizing that valuable ideas, resources, and expertise can also originate from external sources. Open innovation is defined as the strategic use of both inflows and outflows of knowledge, enabling companies not only to improve their internal innovation processes but also to expand into new markets through the external application of their innovations (Cheng & Huizingh, 2014). The concept stands in contrast to "closed innovation," where all innovations are developed internally through in-house Research and Development (R&D) without significant external collaboration (Greco et al., 2016). By adopting open innovation, firms can access a wider range of insights and technologies, accelerate the development cycle, and create mutual value through the exchange of knowledge, ultimately improving competitiveness in a rapidly evolving market environment.

Access to external knowledge through open innovation has increasingly been acknowledged as a vital driver of firm innovativeness (Duysters & Lokshin, 2011). Consequently, recent scholarly reviews indicate a growing academic interest in examining how open innovation strategies influence firms' innovation outcomes (Greco et al., 2016). The open innovation perspective highlights that research and development activities should not rely solely on internal capabilities. Instead, firms are encouraged to integrate external resources and knowledge sources, allowing them to identify new implementable solutions while also extracting greater value from internal assets that might otherwise remain underutilized (Lopes et al., 2022). To sustain competitiveness, organizations must therefore assess the key factors and conditions that

determine how open innovation contributes to improved economic performance and long-term growth (Distefano et al., 2016).

Furthermore, reviews of highly cited studies have explored how innovative small and medium-sized enterprises adopt open innovation practices, reinforcing the importance of innovation within the MSME sector. Innovation is widely regarded as a fundamental element in supporting the expansion and sustainability of MSMEs. These enterprises play a strategic role in advancing digital connectivity and transformation, positioning them as key drivers of the contemporary digital economy. In response, governments across various countries have introduced regulatory initiatives and policy measures to strengthen MSME innovation capacity, including financial support for innovation programs and the development of collaborative networks between universities and MSMEs (Judijanto et al., 2024).

According to Rumanti et al. (2023), the implementation of open innovation within the MSME framework is specifically categorized into two primary dimensions, namely inbound open innovation and outbound open innovation. Inbound open innovation refers to the practice of sourcing and integrating external knowledge and technology to enhance internal innovation processes, while outbound open innovation involves the external exploitation of internal ideas and technologies to capture value through pathways outside the firm's boundaries. By understanding these dimensions, MSMEs can more effectively manage the flow of knowledge to ensure long-term growth and adapt successfully to the challenges presented by the modern business landscape.

### 2.2.1 Open Innovation Theory

Open Innovation Theory, first introduced by Henry Chesbrough (2003), is a fundamental framework for understanding how firms innovate and integrate external knowledge to achieve sustainable competitive advantage. This paradigm challenges the traditional "closed innovation" model, in which all ideas, research, and commercialization processes occur strictly within the boundaries of the organization. Instead, Chesbrough emphasizes that organizations should strategically leverage both

internal and external ideas, as well as internal and external pathways to market, in order to accelerate technological advancement and improve business outcomes.

In the evolving context of digital transformation and technology adoption, open innovation plays an increasingly critical role in enabling firms to respond effectively to rapid market changes, technological disruptions, and shifting consumer expectations. By adopting open innovation practices, companies can integrate a diverse range of knowledge sources, such as customer feedback, supplier expertise, research collaborations, and competitor benchmarking. This integration fosters service innovation, facilitates value co-creation, and enhances adaptability in a competitive business environment (Chesbrough, 2003).

Guided by the principles of Open Innovation Theory, the incorporation of advanced digital transformation technologies, such as artificial intelligence, big data analytics, and platform-based business models enables organizations to access valuable external insights, engage in collaborative ventures with a wide array of stakeholders, and jointly develop products or services with end-users. These capabilities not only improve operational efficiency but also create opportunities to generate new revenue streams, strengthen market positioning, and achieve better financial performance (Chesbrough, 2003).

### 2.3 Business Resilience

In the current era of heightened uncertainty and rapid business environment, resilience has become a critical factor for organizational survival and growth. The accelerating pace of innovation, rapid technological evolution, climate change, and global health crises have collectively placed the economy under continuous tension and uncertainty. A study conducted in the United States involving 5,800 small firms revealed that 43 percent were expected to shut down due to the impacts of the COVID-19 pandemic (Bartik, Bertrand et al., 2020). The pandemic not only caused significant fluctuations in the economy but also introduced substantial environmental changes, particularly affecting small and medium entrepreneurs. Faced with these challenges, Small and

Medium Enterprises (SMEs) are required to prioritize agility and adaptability as strategic responses to maintain competitiveness and match the performance levels of larger, more profitable companies (Abu Hasan et al., 2022).

Resilience, in this context, refers to an organization's ability to withstand periods of stress, restore critical functions, and continue to thrive in altered circumstances. The term itself originates from the field of physics, where it describes a material's capacity to return to its original form after deformation (Liu et al., 2021). In the business domain, resilience can be understood as an organization's capability to seize opportunities and adapt advantageously to changes, even in challenging conditions.

Despite these evolving challenges, many firms still rely on traditional strategies, such as maximizing short-term profits or implementing rigid operational plans. However, in an environment characterized by unpredictability, constant change, and uncertainty, such approaches are insufficient. Achieving resilience requires adopting alternative business models that incorporate multi-timescale perspectives and account for unidentified risks. According to Reeves and Whitaker (2020), building a resilient organizational structure involves adhering to six core principles: redundancy, diversity, modularity, adaptability, prudence, and embeddedness. These principles serve as guiding frameworks to help organizations remain robust and responsive in times of disruption.

Furthermore, technology and innovation play a vital role in enhancing business resilience. As emphasized by Hidayat et al. (2020), leveraging technology enables businesses to establish strong and profitable relationships with customers, while simultaneously providing the convenience and value that sustain customer loyalty. By integrating innovation into their operations, organizations can not only navigate disruptions more effectively but also secure long-term growth in an increasingly competitive marketplace (Judijanto et al., 2024).

According to Lestari et al. (2024), business resilience in the MSME sector is manifested through several critical dimensions, including the maintenance of operational

continuity to ensure business activities persist during disruptions and the cultivation of a positive mindset among owners to remain optimistic in facing adversity. Additionally, it involves the strength of networking to leverage external support and resources, as well as effective financial management to maintain liquidity and stability under economic pressure. Therefore, a comprehensive understanding of these indicators is essential for MSMEs to navigate the complexities of the modern business landscape and ensure their long-term sustainability.

## 2.4 Previous Research

The development of the research framework in this study is grounded in a comprehensive review of existing literature regarding digital transformation and open innovation. Based on the Table 2.1, it has been shown that ICT adoption generally has a positive effect on MSMEs, similarly to open innovation. However, there is still no research that specifically examines the combined influence of ICT adoption and open innovation on business resilience among food and beverage MSMEs in Bandar Lampung. Therefore, this study presents a clear novelty by focusing on this unique context and providing new insights into the relationship between digital adoption, innovation, and resilience among food and beverage MSMEs in Bandar Lampung.

**Table 2.1 Previous Research**

| No | Researchers | Title | Sample and Analytical Tools | Method | Result |
|---|---|---|---|---|---|
| 1 | Lekić et al. (2023) | Analysis of the ICT Sector in the Function of Enhancing Business Resilience | The study analyzed 2,349 ICT companies in Serbia, including 1,483 software firms employing 28,543 people in 2018. Analytical tools included descriptive statistics, comparative analysis (Serbia vs. EU/global ICT trade), and percentage change analysis over two five- | Comparative analysis | Studies indicate that the ICT sector plays a vital role in enhancing business resilience by strengthening innovation and human resources, adapting to global markets, and fostering SME consolidation. |

| No | Researchers | Title | Sample and Analytical Tools | Method | Result |
|---|---|---|---|---|---|
| | | | year periods (2010–2014 and 2015–2019). | | |
| 2 | Judjianto et al. (2024) | A Holistic Review of MSME Entrepreneurship in Indonesia: The Role of Innovation, Sustainability, and the Impact of Digital Transformation | The study involved 40 food-processing MSMEs in Lampung, selected through purposive sampling. Analytical tools included descriptive statistics, simple and multiple regression analysis, classical assumption tests (VIF, normality, heteroskedasticity, autocorrelation), and significance tests (t-test, F-test) using SPSS 26 and Excel. | Quantitative | Innovation strengthens MSME resilience, sustainability supports long-term growth and SDGs, and digital transformation drives entrepreneurship despite literacy and resource challenges. |
| 3 | Sutarni et al. (2023) | Adopsi Teknologi Informasi Dan Komunikasi Untuk Meningkatkan Kinerja UMKM Berbasis Pangan Olahan Di Provinsi Lampung | The study involved 40 food-processing MSMEs in Lampung, selected through purposive sampling. Analytical tools included descriptive statistics, simple and multiple regression analysis, classical assumption tests (VIF, normality, heteroskedasticity, autocorrelation), and significance tests (t-test, F-test) using SPSS 26 and Excel. | Quantitative Survey | The adoption of ICT by processed food MSMEs in Lampung remains low, yet it has a significant impact on improving business performance. Individual and technological factors play a key role in driving ICT adoption. Training interventions and supportive policies are needed to expand its utilization. |
| 4 | Kumar et al. (2022) | Adoption of ICTs as an Emergent Business Strategy During and Following COVID-19 Crisis: Evidence from Indian MSMEs | The study analyzed 393 valid responses from an initial 453 (response rate 56.5%), with most from small firms, manufacturing sector, and partnerships. Analytical tools included descriptive statistics and Chi-Square for demographic and ICT usage | Mixed method approach | This study robustly demonstrates ICT's role in sustaining MSMEs during COVID-19, emphasizing remote work tools and business sustainability as key drivers. |

| No | Researchers | Title | Sample and Analytical Tools | Method | Result |
|---|---|---|---|---|---|
| | | | differences, and PLS-SEM (Smart-PLS 3.3.3) to test latent variable relationships, with reliability, validity, and bootstrapping assessments. | | |
| 5 | Rumanti et al. (2022) | Innovation Capability and Open Innovation for Small and Medium Enterprises (SMEs) Performance: Response in Dealing with the COVID-19 Pandemic | The sample included BRIC countries (Brazil, Russia, India, and China) from 2005 to 2011. and applied correlation analysis as well as Random-effects GLS regression, including the impact of the 2008 financial crisis. | Quantitative emphirical | This study confirms that innovation and open collaboration are key to SME resilience during the pandemic, particularly through leveraging external knowledge (inbound OI) and strengthening internal capabilities (IC). The findings are relevant for policymakers and SME actors in designing post-crisis recovery strategies. |

Source: Arranged by the author based on previous research

Building upon the previous research summarized in Table 2.1 above, this study introduces a distinct novelty by investigating the synergy between ICT Adoption and Open Innovation. The uniqueness is further emphasized by the focus on the FnB MSME sector in Bandar Lampung, an area that has remained under-researched in this specific academic framework.

## 2.5 Research Hyphotesis

A hypothesis is a provisional statement that predicts the relationship between variables and requires verification. Essentially, it serves as an assumption grounded in relevant theories and prior research, which is then tested through systematic analysis (Yam & Taufik, 2021). Previous studies indicate that the level of ICT adoption among processed food MSMEs in Lampung remains relatively low, yet it has shown a significant role in improving business performance. Both individual and technological factors are critical in encouraging ICT adoption, while training initiatives and supportive policies are

necessary to expand its use (Sutarni et al., 2023). In addition, research highlights that innovation and open collaboration are vital drivers of SME resilience, especially during crisis periods. By leveraging external knowledge through inbound open innovation and strengthening internal capabilities, SMEs are better able to adapt and sustain their operations. These insights provide important implications for policymakers and practitioners in designing effective recovery strategies for MSMEs (Rumanti et al., 2022).

ICT adoption enables small businesses to streamline operations, reduce costs, enhance productivity, and improve connectivity with suppliers and customers (Qalati et al., 2021). Based on these findings, the first hypothesis of this study is proposed as follows: **$H_1$: ICT adoption has a positive and significant effect on the business resilience of food and beverage MSMEs in Bandar Lampung.**

Furthermore, access to external knowledge through open innovation is increasingly recognized as a critical source of firms' innovativeness (Duysters & Lokshin, 2011). Open innovation allows companies to move beyond the limits of their internal resources by actively seeking knowledge, technologies, and expertise from external actors such as universities, research centers, suppliers, customers, and even competitors. This approach creates opportunities for organizations to integrate diverse perspectives and reduce the risks and costs related to research and development. It also helps companies to respond more quickly to market changes, as external collaboration can accelerate the process of generating, testing, and applying new ideas. In this sense, open innovation serves not only as a mechanism for expanding knowledge but also as a strategic tool for maintaining competitiveness in a highly dynamic business environment.

In line with recent reviews, studies on the relationship between open innovation strategies and innovation performance have attracted growing attention in the literature (Greco et al., 2016). These studies highlight that firms adopting open innovation practices often demonstrate higher levels of innovation output and stronger market performance compared to firms that rely exclusively on internal knowledge sources.

Moreover, the effectiveness of open innovation is closely linked to the firm's ability to manage external relationships, absorb external knowledge, and align it with internal processes. Thus, successful implementation requires both strategic collaboration and organizational capabilities that support knowledge integration. Building on these insights, and considering the importance of collaboration and knowledge sharing across organizational boundaries, the second hypothesis is formulated as follows: **$H_2$: Open innovation ha3s a positive and significant effect on the business resilience of food and beverage MSMEs in Bandar Lampung.**

## 2.6 Theoretical Framework

The theoretical framework of this study draws on Teece's Dynamic Capabilities Theory and Chesbrough's Open Innovation Theory. Dynamic Capabilities Theory emphasizes that organizations with strong dynamic capabilities can effectively manage technology adoption by sensing new opportunities, making strategic decisions to seize them, and transforming their structures and resources to leverage emerging technologies (Teece, 2010). Effective ICT adoption enables small businesses to streamline operations, reduce costs, increase productivity, and strengthen connectivity with suppliers and customers (Qalati et al., 2021). In addition, Open Innovation Theory highlights the importance of integrating internal and external knowledge to drive innovation, enhance adaptability, and improve organizational competitiveness. Based on these perspectives, this study's conceptual framework connects ICT adoption and open innovation to the development of business resilience.

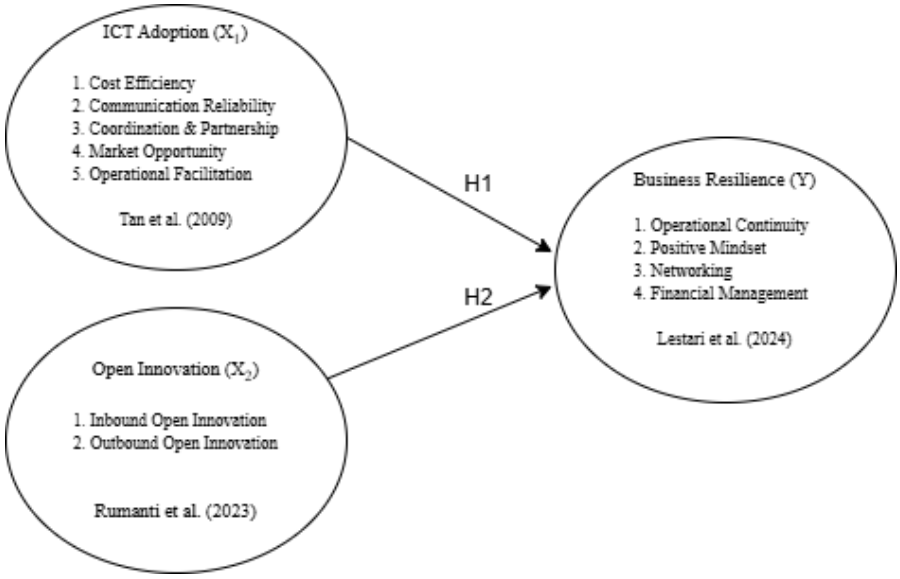


**Figure 2.1 Conceptual Framework**

# III. METHODOLOGY

## 3.1 Research Design

Research design refers to the structured plan that connects the conceptual framework of a study to its empirical investigation. It serves as a blueprint that guides researchers in systematically addressing research questions and achieving the study's objectives (Asenahabi, 2019). This study employ quantitative research design, Quantitative research focuses on collecting and analyzing numerical data to study measurable phenomena (Kothari, 2004). It uses structured data collection, systematic procedures, and statistical techniques to ensure accuracy and reliability. This approach aims to provide objective, evidence-based insights through methods such as inferential, experimental, and simulation research.

This study is best suited for a quantitative research approach because it seeks to measure and analyze the relationships between ICT adoption ($X_1$), open innovation ($X_2$), and business resilience (Y) among food and beverage MSMEs in Bandar Lampung. The variables examined in this research can be quantified and expressed numerically, allowing for objective measurement and statistical analysis. By using structured questionnaires and a systematic data collection process, this study ensures accuracy, reliability, and replicability of results. A quantitative approach also enables hypothesis testing and provides evidence-based conclusions, making it appropriate for identifying patterns, relationships, and the extent of influence among variables in a clear and measurable manner.

## 3.2 Object Research

The object of this research is Micro, Small, and Medium Enterprises (MSMEs) in the food and beverage sector located in Bandar Lampung that have adopted Information

and Communication Technology (ICT) in their business operations. This sector was selected because food and beverage MSMEs play a significant role in the local economy, contributing to job creation and regional economic growth. However, these businesses often face challenges in maintaining competitiveness, particularly in adapting to technological changes and responding to market dynamics. By focusing on MSMEs that have implemented ICT, whether through digital marketing, online sales platforms, or technology system, this study aims to understand how ICT adoption and open innovation strategies influence their business resilience. This focus is highly relevant because digital transformation has become a critical factor for survival and growth.

## 3.3 Population and Sample

### 3.3.1 Population

The population refers to the entire group of individuals, events, or entities that a researcher aims to study and draw conclusions about based on data collected from a sample (Sekaran & Bougie, 2016)**.** The target population is a more specific group within this population that the researcher intends to focus on and can realistically access. Defining the target population requires careful consideration of factors that set its boundaries to ensure it is broad enough to provide sufficient data but specific enough to avoid including unsuitable participants who may distort the findings. Clearly identifying and describing the target population is essential for accurate data collection and analysis. Researchers must also understand its composition and size, as these determine who is included or excluded based on relevant criteria (Hossan et al., 2023). For this study, the population consists of owners and managers of Micro, Small, and Medium Enterprises (MSMEs) in the food and beverage (F&B) sector in Bandar Lampung who have implemented Information and Communication Technology (ICT) in their business operations.

### 3.3.2 Sample

A sample is a subset of the population. It comprises some members selected from it. In other words, some, but not all, elements of the population form the sample (Sekaran & Bougie, 2016). It helps to make sure these groups in the study are well-connected and aligned with each other (Paper, 2025). The sampling technique employed in this study utilized nonprobability sampling, specifically the purposive sampling method. Nonprobability sampling indicates a sampling methodology in which not all individuals throughout the population are given an equal opportunity to be selected as members of the sample (Suriani and Jailani, 2023). Purposive sampling, also known as judgmental, selective, or subjective sampling, is a commonly used nonprobability technique in qualitative research (Tajik et al., 2024). This method allows researchers to focus on specific characteristics of the population that are relevant to the study.

The Slovin formula is a simple method used to determine the appropriate sample size from a known population with a specified level of precision. This formula helps researchers calculate the minimum number of respondents needed to ensure that the sample is representative, based on the total population size (N) and the desired margin of error (e) (Santoso, 2023). The total MSMEs FnB sector in Bandar Lampung is 1183 (Badan Pusat Statistik Kota Bandar Lampung, 2025). Therefore, the formula is expressed as:

$$n = \frac{N}{1 + (Ne^2)} = \frac{1183}{1 + (1183 \times 0.09^2)} = \frac{1183}{10.58} = 111.8 \sim 112$$

Desciption:

n: Sample size

N: Population Size

e: Desired level of precision

From the result above, it is found that the data needed in this sample are 112 data, which are determined with an error rate of 9%.

### 3.4 Source of Data

The Primary data refers to information that is obtained directly from the source and collected for the first time, thereby ensuring its originality (Kothari, 2004). In this study, the primary data were gathered through a structured questionnaire aimed at examining ICT adoption, open innovation, and MSME performance. The questionnaire was distributed to respondents representing Micro, Small, and Medium Enterprises (MSMEs) in the Food and Beverages sector within the city of Bandar Lampung.

### 3.5 Data Collection Method

A questionnaire is a structured tool for data collection consisting of a series of questions arranged in a clear and organized order, either printed or typed on a form. Respondents are expected to read and understand each question and provide their answers in the designated spaces independently, without external assistance. This method of distributing questionnaires, whether through mail, telephone, or online platforms, is widely used in economic and business research because it enables researchers to gather information efficiently from respondents located across broad or remote geographical areas (Khatis, 2024; Kuphanga, 2024).

The questionnaire method is chosen because of it is a versatile and effective approach for collecting standardized data, particularly in quantitative research. Its structured design supports consistency in organizing and analyzing data, while also offering cost-effectiveness, accessibility, and the ability to reach diverse populations. Moreover, advancements in technology, such as online questionnaires, have made it easier to distribute surveys and reach specific demographics, including younger populations, thereby improving the overall effectiveness of this method (Kuphanga, 2024).

To measure the data, the author will use likert scale. The likert scale is designed to examine how strongly subjects agree or disagree with statements on a five-point scale with the following anchors:

**Table 3.1 Likert Scale**

| | |
|---|---|
| (SA) Strongly Agree | 5 |
| (A) Agree | 4 |
| (N) Neutral | 3 |
| (D) Disagree | 2 |
| (SD) Strongly Disagree | 1 |

Source: Sekaran and Bougie (2016)

### 3.6 Research Variable

A variable refers to any object, event, idea, emotion, time frame, or other category that a researcher aims to measure. According to scholars, variables are conditions or characteristics that can be manipulated, controlled, or observed by the researcher. They serve as essential elements of a study and form the foundation of any research work (Abiodun-Oyebanji, 2017).

#### 3.6.1 Independent Variable

An independent variable is a factor that affects the dependent variable, either positively or negatively. This means that when the independent variable is present, the dependent variable is also observed, and any change in the independent variable, whether an increase or decrease results in a corresponding change in the dependent variable. In other words, variations in the dependent variable are explained by the independent variable (Kothari, 2004). In the context of this research, the independent variable have been identified as follows:

1. Information and Communication Technology (ICT) Adoption ($X_1$)

   The concept of ICT adoption refers to the deliberate process through which Micro, Small, and Medium Enterprises (MSMEs) integrate technological solutions, such as

digital devices, mobile phones, and network infrastructure, into their core operations (V. Kumar et al., 2022). This study will analyze the indicators as described in the research conducted by Kumar et al. 2022 and Tan et al. 2009.

2. Open Innovation ($X_2$)

Open innovation can be understood as a strategic framework that allows SMEs to strengthen both product and process innovation by deliberately managing the exchange of knowledge across organizational boundaries. By facilitating the purposeful inflow and outflow of ideas, firms are able to accelerate their innovation processes more effectively (Rumanti et al., 2023). This study will analyze the indicators as described in the research conducted by Rumanti et al. 2023.

### 3.6.2 Dependent Variable

The dependent variable is the key variable that holds the main focus of the researcher's investigation. The objective is to understand and describe this variable, explain the factors that influence its variation, or predict its outcomes. In other words, it serves as the central element of the study and is examined as a significant factor for analysis (Kothari, 2004). In the context of this research, the Dependent variable have been identified as follows:

1. Business Resilience

Resilience refers to an organization's ability to withstand periods of stress, restore critical functions, and continue to thrive in altered circumstances In the business domain, resilience can be understood as an organization's capability to seize opportunities and adapt advantageously to changes, even in challenging conditions (Reeves and Whitaker, 2020). This study will analyze the indicators as described in the research conducted by Rumanti et al. (2023). This study will analyze the indicators as described in the research conducted by Lestari et al. (2024).

## 3.7 Operational Variable and Indicators

**Table 3.2 Operational Variable and Indicators**

| Variable | Items | Scale |
|---|---|---|
| Information and Communication Technology (ICT) Adoption ($X_1$) | 1. Adoption of ICT is potential to reduce business correspondence costs. (X1.1)<br>2. Adoption of ICT increase speed and reliability of business communication. (X1.2)<br>3. Adoption of ICT enable my organization to provide better service to my customers. (X1.3)<br>4. Adoption of ICT enable my organization to have better access to customer and 'suppliers' information. (X1.4)<br>5. Adoption of ICT facilitate new ways of managing and organizing businesses. (X1.5) | Likert Scale 1 – 5 (5 Items) |
| Open Innovation ($X_2$) | 1. External parties are directly involved in innovation activities within the organization (X2.1)<br>2. The government assists in innovation activities within the organization (X2.2)<br>3. Consumers assist in innovation activities within the organization (X2.3)<br>4. Competitors assist in innovation activities within the organization (X2.4)<br>5. Research institutes assist in innovation activities within the organization (X2.5)<br>6. Universities or educational institutions contribute to innovation activities within the organization (X2.6)<br>7. Suppliers contribute to innovation activities within the organization (X2.7)<br>8. Some consultants provide assistance in innovation activities within the organization (X2.8) | Likert Scale 1 – 5 (14 Items) |

| Variable | Items | Scale |
|---|---|---|
| | 9. Innovation activities carried out by organizations depend on external assistance (X2.9)<br>10. This organization uses the latest tools to enhance internal innovation (X2.10)<br>11. The organization uses the latest in materials (fabrics, dyes, waxes, etc.) to increase internal innovation (X2.11)<br>12. This organization purchases patents for internal innovation activities (X2.12)<br>13. This organization purchases copyrights to be used for internal innovation activities (X2.13)<br>14. This organization purchases licenses to use for internal innovation activities (X2.14) | |
| Business Resilience (Y) | 1. We still run our business as usual during the Covid-19 pandemic. (Y.1)<br>2. Our business remains resilient because we think that the Covid-19 pandemic is a challenge that must be faced positively rather than feared (Y.2)<br>3. We believe that building networks is important for business resilience.(Y.3)<br>4. The provision of complete business accounting records also contributes to business resilience (Y.4) | Likert Scale 1 – 5 (4 Items) |

Source: Arranged by Author

## 3.8 Data Analysist Technique

### 3.8.1 Descriptive Analysis

Descriptive statistics represents the initial stage of data analysis, focusing on describing and summarizing collected data to provide a clear understanding of its main characteristics (Sarmento & Costa, 2017). Closely aligned with this, descriptive

analytics encompasses the systematic process of collecting, organizing, and presenting data in a structured manner. Through the use of statistical methods, as well as visual tools such as charts, tables, and graphs, descriptive analytics facilitates the identification of patterns, monitoring of progress, and comparison of data, enabling researchers or organizations to better understand and interpret historical data effectively (Wolniak, 2023). The criteria of descriptive analysis can be seen on Table 3.3 (Muhidin and Abdurrahman, 2007).

**Table 3.3 Descriptive Analysis Criteria**

| Value Category Range | Interpretive Value |
|---|---|
| 1.00 – 1.79 | Very Poor/Very Low |
| 1.80 – 2.59 | Poor/Low |
| 2.60 – 3.39 | Fair/Moderate |
| 3.40 – 4.19 | Good/High |
| 4.20 – 5.00 | Very Good/Very High |

Source: Muhidin and Abdurrahman (2007).

### 3.8.2 Classical Assumption Test

According to Ghozali (2018), classical assumption tests are conducted to ensure that the regression model used in a study is free from bias and able to generate reliable and accurate estimates. These tests are important to confirm that the model satisfies the basic requirements of classical linear regression. In this research, the classical assumption tests consist of the normality test, multicollinearity test, and heteroscedasticity test. Each test has a specific role in assessing the suitability of the regression model for hypothesis testing, as explained below:

1. Normality Test

   The normality test aims to determine whether the residuals of the regression model are normally distributed. A regression model is considered appropriate when its residuals follow a normal distribution, as this condition supports the validity of statistical tests such as the t-test and the estimation of regression coefficients. In this

study, the normality test is performed using the Kolmogorov–Smirnov (K–S) test and is supported by visual analysis through histograms and Normal P–P Plots generated by SPSS. The decision criteria are as follows:

1) If the significance value (Asymp. Sig) is greater than 0.05, the residuals are normally distributed.
2) If the significance value (Asymp. Sig) is less than 0.05, the residuals are not normally distributed.

2. Multicollinearity Test

The multicollinearity test is conducted to examine whether there is a high correlation among the independent variables. Multicollinearity can lead to biased regression coefficient estimates and make it difficult to identify the individual effect of each independent variable. In this research, multicollinearity is assessed using the Tolerance value and the Variance Inflation Factor (VIF) obtained from SPSS output. The decision criteria are as follows:

1) If the Tolerance value is greater than 0.10 and the VIF value is less than 10, multicollinearity does not occur.
2) If the Tolerance value is less than 0.10 and the VIF value is greater than 10, multicollinearity is indicated.

3. Heteroscedasticity Test

The heteroscedasticity test is used to evaluate whether the residuals in the regression model have constant variance across all levels of the independent variables. A reliable regression model should exhibit homoscedasticity, where the variance of the residuals remains stable. The presence of heteroscedasticity may reduce the efficiency of the regression estimates. In this study, heteroscedasticity is tested using the Glejser test available in SPSS.
The decision criteria are as follows:

1) If the significance value (Sig) is greater than 0.05, heteroscedasticity is not detected.
2) If the significance value (Sig) is less than 0.05, heteroscedasticity is considered to exist.

### 3.8.3 Multiple Linear Regression Analysis

Multiple Linear Regression Analysis is a statistical method used to model the relationship between a dependent variable and two or more independent variables, also known as predictors. This technique allows researchers to predict changes in the dependent variable based on variations in the independent variables. By examining the combined influence of multiple predictors, this analysis provides a comprehensive understanding of how each independent variable contributes to explaining or predicting the outcome (Sudariana & Yoedani, n.d.).

In the context of this study, Multiple Linear Regression Analysis is applied to investigate the influence of ICT Adoption and Open Innovation as independent variables on Business Resilience as the dependent variable among Food and Beverage MSMEs in Bandar Lampung. This approach enables a precise evaluation of how these two key factors collectively and individually affect the resilience of businesses, offering insights into strategies for strengthening MSME performance. Furthermore, standardized regression coefficients (beta) are employed in the analysis to assess and compare the relative strength of the influence of ICT Adoption and Open Innovation on Business Resilience. Therefore, the mathematical equation for multiple linear regression in this study is as follows:

$$\text{Business Resilience } (Y) = a + b_1\,(\text{ICT Adoption}) + b_2\,(\text{Open Innovation}) + e$$

Explanation:

- **Y (Business Resilience)** = Dependent variable.
- **ICT Adoption ($X_1$)** = First independent variable.
- **Open Innovation ($X_2$)** = Second independent variable.

- **a** = Constant (intercept).
- **$b_1$, $b_2$** = Regression coefficients that indicate the direction and magnitude of the influence of each independent variable on Y.
- **e** = Error or residual term.

Brief Interpretation:

- If **$b_1 > 0$**, an increase in ICT Adoption tends to increase Business Resilience (holding $X_2$ constant).
- If **$b_2 > 0$**, an increase in Open Innovation tends to increase Business Resilience (holding $X_1$ constant).

### 3.8.4 Hyphotesis Testing

Hypothesis testing in this study is carried out using t-statistics and probability values. At a 5% significance level, the critical value of the t-statistic is 1.96. The decision rule is that a hypothesis is accepted if the t-statistic is greater than 1.96 and the p-value is less than 0.05.

## 3.9 Pilot Test

A pilot test is conducted to assess the validity and reliability of the research instrument before the questionnaire is formally distributed to respondents. In this preliminary stage, the questionnaire is administered to a sample of 30 owners and managers of Micro, Small, and Medium Enterprises (MSMEs) operating in the Food and Beverages sector in Bandar Lampung. The data were analysed using two statistical methods. For the main study, the validity assessment will employ Pearson's product-moment correlation. This method is better suited for larger sample sizes and evaluates the relationship between individual items and the total score. Reliability will again be measured using Cronbach's Alpha, which indicates the internal consistency of the questionnaire items. This two-stage approach ensures that the pilot test provides an initial evaluation of the research instrument. Consequently, the questionnaire used in

the main study can be applied with greater confidence as a valid and reliable tool for measurement.

### 3.9.1 Validity Test

Validity Test refers to the process of determining the extent to which a measurement instrument accurately assesses what it is intended to measure. Ensuring validity is essential for producing accurate and meaningful research outcomes. High validity allows researchers to draw sound conclusions, make informed decisions, and strengthen the credibility and applicability of their findings (Andersson et al., 2024).

In the pilot phase, the validity of the research instrument was assessed using pearson validity. Pearson validity refers to the use of the Pearson Product–Moment Correlation Coefficient (r) to test the validity of an instrument, such as a questionnaire or survey, by measuring the relationship between each item and the total score. In other words, it checks whether each question accurately represents the concept being measured. A higher correlation value indicates that the item is strongly related to the overall construct, meaning it is a valid item. Typically, a Pearson correlation value above 0.30 is considered acceptable for validity in social science research, but this threshold can vary depending on the context and the number of respondents. Researchers often calculate Pearson validity to ensure that each question contributes meaningfully to the measurement of the variable in a study, which is important for maintaining the reliability and quality of the data.

### 3.9.2 Result of Validity Pilot Test

Pearson validity refers to the use of the Pearson Product–Moment Correlation Coefficient (r) to test the validity of an instrument, such as a questionnaire or survey, by measuring the relationship between each item and the total score. In other words, it checks whether each question accurately represents the concept being measured. A higher correlation value indicates that the item is strongly related to the overall construct, meaning it is a valid item. Typically, a Pearson correlation value above 0.30 is considered acceptable for validity in social science research.

According to the results presented in the Table 3.4, all items under the variable demonstrate Pearson correlation coefficients exceeding the threshold of 0.30. This outcome suggests that each item has a sufficient positive relationship with the total score, confirming that the items are statistically valid (Hair et al., 2022). In other words, every question in the instrument effectively represents the construct being measured and contributes meaningfully to the overall scale, which supports the reliability and quality of the questionnaire for further analysis.

**Table 3.4 Validity Test Result**

| Variable | Indicators | Pearson Correlation | Standard Value | Interpretaion |
|---|---|---|---|---|
| **ICT Adoption** | ICT1 | 0.828 | 0.30 | Valid (>0.30) |
| | ICT2 | 0.928 | 0.30 | Valid (>0.30) |
| | ICT3 | 0.918 | 0.30 | Valid (>0.30) |
| | ICT4 | 0.919 | 0.30 | Valid (>0.30) |
| | ICT5 | 0.839 | 0.30 | Valid (>0.30) |
| **Open Innovation** | OI1 | 0.690 | 0.30 | Valid (>0.30) |
| | OI2 | 0.728 | 0.30 | Valid (>0.30) |
| | OI3 | 0.798 | 0.30 | Valid (>0.30) |
| | OI4 | 0.612 | 0.30 | Valid (>0.30) |
| | OI5 | 0.760 | 0.30 | Valid (>0.30) |
| | OI6 | 0.760 | 0.30 | Valid (>0.30) |
| | OI7 | 0.892 | 0.30 | Valid (>0.30) |
| | OI8 | 0.867 | 0.30 | Valid (>0.30) |
| | OI9 | 0.874 | 0.30 | Valid (>0.30) |
| | OI10 | 0.860 | 0.30 | Valid (>0.30) |
| | OI11 | 0.772 | 0.30 | Valid (>0.30) |
| | OI12 | 0.889 | 0.30 | Valid (>0.30) |
| | OI13 | 0.690 | 0.30 | Valid (>0.30) |
| | OI14 | 0.876 | 0.30 | Valid (>0.30) |

| Variable | Indicators | Pearson Correlation | Standard Value | Interpretaion |
|---|---|---|---|---|
| **Business Resilience** | BR1 | 0.876 | 0.30 | Valid (>0.30) |
| | BR2 | 0.913 | 0.30 | Valid (>0.30) |
| | BR3 | 0.900 | 0.30 | Valid (>0.30) |
| | BR4 | 0.861 | 0.30 | Valid (>0.30) |

Source: Data processed by author (2025)

### 3.9.3 Reliability Test

Reliability Test refers to the assessment of a measurement's consistency and stability across time, items, or raters, where a reliable instrument is expected to produce consistent results under similar conditions, thereby minimizing measurement error and enhancing the credibility of research findings. This test is applied to indicators that have previously been confirmed as valid (Andersson et al., 2024). In this study, the reliability of the research instruments in the pilot test was evaluated using Cronbach's Alpha to measure the internal consistency of each construct. According to Sugiyono (2017), an instrument is considered reliable if it achieves a Cronbach's Alpha value greater than 0.70, while measurement criteria also indicate that a Cronbach's Alpha value above 0.60 reflects acceptable reliability for data analysis.

Based on Table 3.5, the results indicate that the ICT Adoption construct, measured using five items, obtained a Cronbach's Alpha value of 0.928, demonstrating a very high level of internal consistency. Furthermore, the Open Innovation construct, which consists of fourteen items, achieved a Cronbach's Alpha value of 0.950, indicating excellent reliability among its indicators. In addition, the Business Resilience construct, measured using four items, recorded a Cronbach's Alpha value of 0.908, which exceeds the recommended threshold and reflects strong internal consistency. Overall, these findings confirm that all constructs used in the pilot test meet the required reliability criteria and are therefore reliable and suitable for use in the main study.

**Table 3.5 Reliability Test Result**

| Construct | Number of Items | Cronbach's Alpha | Interpretation |
|---|---|---|---|
| ICT Adoption | 5 | 0.928 | Reliable |
| Open Innovation | 14 | 0.950 | Reliable |
| Business Resilience | 4 | 0.908 | Reliable |

Source: Data processed by author (2025)

# V. CONCLUSION AND RECOMMENDATION

## 5.1 Conclusion

This study aims to examine the influence of ICT Adoption and Open Innovation on Business Resilience among Micro, Small, and Medium Enterprises (MSMEs) in the Food and Beverage sector in Bandar Lampung. Based on the series of quantitative analyses conducted, the study concludes that business resilience among MSMEs is not shaped by a single factor, but rather emerges from the interaction between technological capability and collaborative innovation practices. These findings highlight that resilience in MSMEs is multidimensional, requiring both internal operational readiness through digital technology and external knowledge integration through open innovation to effectively respond to market dynamics, competitive pressure, and environmental uncertainty.

1. **ICT Adoption and Business Resilience ($H_1$)**

   The statistical analysis provides robust evidence to confirm the acceptance of $H_1$, which states that ICT Adoption has a positive and significant effect on Business Resilience. By successfully supporting this hypothesis, the study demonstrates that integrating Information and Communication Technology serves as a central driver in enhancing the capacity of MSMEs to navigate a dynamic business environment. This result indicates that resilience among MSMEs in Bandar Lampung is increasingly driven by information flow; the highest mean score for improved access to customer and supplier information (4.27) suggests that digital systems are vital for facilitating decision-making and connectivity. Although the reduction of communication costs received a lower mean score (3.97), the overall findings validate ICT as a critical tool that enables firms to adapt and remain competitive despite environmental shifts.

2. **Open Innovation and Business Resilience ($H_2$)**

   The findings also provide empirical evidence to validate the acceptance of $H_2$, which states that Open Innovation has a positive and significant effect on Business Resilience. In supporting this hypothesis, the research shows that leveraging external knowledge is a meaningful factor in sustaining an enterprise's ability to survive. This is further reflected in the descriptive results, where customer involvement in innovation activities received the highest rating (mean = 4.06), indicating that MSMEs rely heavily on consumer feedback to adjust their products and services. Conversely, the lower engagement with research institutions (mean = 3.57) highlights that open innovation in this sector is predominantly market-driven. Thus, the support for this hypothesis emphasizes that resilience is strengthened through pragmatic collaboration and the integration of external market insights.

## 5.2 Recommendations

Based on the research findings and conclusions, several recommendations are proposed to address the research objectives and to provide practical, managerial, and policy-oriented contributions for MSMEs in the Food and Beverage sector in Bandar Lampung. These recommendations are directly aligned with the empirical results, particularly the significant influence of ICT Adoption and Open Innovation on Business Resilience.

1. **For MSMEs Owners**

   Based on the finding that ICT adoption significantly enhances access to customer and supplier information (mean = 4.27), business owners are encouraged to transition from basic digital usage toward integrated digital management systems. Instead of relying solely on instant messaging for transactions, implementing structured digital databases can stabilize supply chains and foster deeper customer loyalty through data-driven insights. Furthermore, given that customer involvement is the strongest driver in open innovation (mean = 4.06), owners should formalize co-creation programs. Establishing regular, structured

feedback channels ensures that product development is directly aligned with market demand, thereby strengthening business resilience against competitive pressures.

2. **For Local Government and Policy Makers**

Reflecting the robust impact of ICT and open innovation on MSME resilience in Bandar Lampung, the Department of Cooperatives and MSMEs is urged to facilitate advanced digital transformation programs. These initiatives should move beyond basic digital onboarding and focus on "Digital Integration," teaching owners how to synchronize various digital tools into their core operations. Additionally, the government should act as a strategic bridge to address the lower engagement with research institutions (mean = 3.57). By creating an innovation ecosystem that connects MSMEs with academic researchers and professional culinary associations, the government can ensure a continuous flow of high-quality, competitive business ideas within the region.

3. **For Future Researchers**

While this study confirms that ICT adoption and open innovation are critical for business resilience, it primarily focuses on internal and collaborative capabilities within a specific sector. Future researchers are encouraged to expand this framework by incorporating moderating variables, such as government policy effectiveness or market volatility, to see how these factors interact with digital capabilities. Moreover, future studies should consider a longitudinal approach to observe how resilience evolves over time or broaden the geographical scope beyond Bandar Lampung to verify if these findings remain consistent across diverse regional economic landscapes.

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