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Beyond Silicon Valley: Bandung's Ecosystem Approach to Digital Economic Development

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ABSTRACT

The implementation of the digital economy in Bandung City reflects the synergy between entrepreneurship and technology in driving economic growth. As a creative city, Bandung has leveraged digital technology to strengthen its strategic sectors. Economic acceleration follows an approach adapted from the IMF, ADB, and G20, with operational adjustments tailored to local conditions. Sector analysis is conducted using qualitative techniques with nominal or ordinal scales to measure qualitative variables. Clustering and ranking methods are applied to categorize sectors based on specific criteria, facilitating the identification of priority interventions. The findings indicate that the information and communication sector serves as the primary driver of economic growth in Bandung City. Additionally, the city demonstrates strong MSME diversification, particularly in the food, beverage, and fashion industries. This diversification enhances the resilience of MSMEs against economic crises. Although most MSMEs remain micro-scale with low income levels, they possess growth potential if supported by appropriate policies. The adoption of digital technology has progressed rapidly in marketing and payment systems; however, its application in production and design remains limited and requires further development to enhance business competitiveness.

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1. INTRODUCTION

The rapid advancement of digital technology and internet connectivity has become a key driver of global economic growth, fundamentally reshaping industries, business models, and market dynamics (Szoszkiewicz, 2018) (Zhang et al., 2022) (Aker & Mbiti, 2010) (Bahia et al., 2021). The integration of digital solutions across sectors has enhanced efficiency, expanded market reach, and revolutionized the way economic activities are conducted. Indonesia, as one of the largest economies in Southeast Asia, holds significant potential in this

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digital transformation era. With a population reaching approximately 281.6 million, the country is experiencing a digital revolution fueled by increasing internet penetration, which now exceeds 78%, translating to over 221.56 million active internet users (Kementerian Koordinator Perekonomian RI, 2020). This widespread connectivity has accelerated the adoption of digital services across sectors, paving the way for substantial economic gains.

Projections by Das suggest that Indonesia's digitalization will contribute an estimated USD 150 billion to the economy by 2025 while simultaneously generating an additional 3.7 million jobs (Das et al., 2016). The growth of digital startups further exemplifies Indonesia's rapid digital transformation. Between 2017 and 2019, the number of startups surged from 1,400 to 2,200, positioning Indonesia as the second-largest startup ecosystem in Asia and the fifth globally—trailing only the United States, India, the United Kingdom, and Canada (Gauthier et al., 2020). Moreover, Indonesia's e-commerce market was estimated to be valued at USD 55 billion to USD 65 billion by 2022, underscoring the increasing reliance on digital platforms for economic transactions (Das et al., 2018).

Within the ASEAN (Association of Southeast Asian Nations) region, Indonesia has emerged as a market leader in the digital sector, commanding 40% of ASEAN's total digital economy share as of 2023 (Abdillah, 2024) (Jalli, 2021) (Fatimah et al., 2023). This dominance reflects Indonesia's strong technological adoption, the rise of digital financial services, and the rapid expansion of e-commerce. The World Digital Competitiveness Ranking also indicates a positive trajectory, with Indonesia advancing 11 places—from 56th in 2019 to 45th in 2023—demonstrating progress in technological infrastructure, business agility, and knowledge (IMD World Competitiveness Center, 2024). With digital transformation now serving as the primary backbone of economic growth, projections suggest Indonesia's digital economy could reach a staggering USD 600 billion by 2030, solidifying its role as a global digital powerhouse (Bachtiar et al., 2020).

At the local level, the city of Bandung serves as a prime example of Indonesia's growing digital economy. As the economic epicenter of West Java, Bandung is rapidly adopting digital solutions to optimize business operations, enhance public services, and foster a technology-driven ecosystem (IMD World Competitiveness Center, 2024) (Kementerian Perencanaan Pembangunan Nasional/ Badan Perencanaan Pembangunan Nasional, 2021) (Sujatmiko et al., 2022). Known for its strong entrepreneurial culture, skilled workforce, and strategic geographical position, Bandung has become a hub for technology startups, creative industries, and digital businesses. By integrating digital technology across various economic sectors, the city is laying the groundwork for a more connected, efficient, and sustainable urban economy (Ferlina et al., 2024).

Despite these promising developments, a crucial gap remains: no systematic research has been conducted to measure the digital economy's actual contribution to Bandung's local economic growth. While macroeconomic indicators highlight Indonesia's broader digital transformation, a localized analysis is essential to assess how digitalization impacts Bandung's business environment, workforce, infrastructure, and overall economic trajectory. Without a data-driven understanding of the city's digital economic potential, policymakers, businesses, and other stakeholders may struggle to formulate effective strategies for digital ecosystem development.

2. OBJECTIVES OF THE STUDY

To bridge this knowledge gap, this study aims to map the current conditions and potential of Bandung's digital economy, providing empirical insights to guide decision-making and policy formulation. The study will analyze the key drivers, challenges, and opportunities in Bandung's digital transformation and offer strategic recommendations for sustainable and inclusive digital growth.

As a conceptual foundation, the study defines the digital economy as encompassing all economic activities driven by digital technology, spanning the production, distribution, and consumption of goods and services (Bukht & Heeks, 2017). The adoption of digital solutions has been proven to enhance efficiency, stimulate innovation, and expand access to global markets. Empirical research suggests that companies integrating digital technology can achieve productivity gains of up to 30% compared to firms that rely on traditional, non-digital methods (Silva et al., 2013) (Li & Wu, 2023) (Zhang et al., 2022). Additionally, the digitalization of key sectors—particularly e-commerce, financial services, and manufacturing—has strengthened cross-border trade and regional economic integration, creating new opportunities for businesses and consumers alike (World Bank Group, 2024) (Li & Wu, 2023).

While the economic potential of digitalization is evident, important questions remain:

1. To what extent can digital economy-driven growth truly enhance the quality of life for all segments of

Bandung's population?
2. Can the digital economy contribute to reducing socio-economic inequality, or will it further exacerbate existing disparities?

3. RESEARCH QUESTIONS

Guided by these considerations, this study—titled "Digital Economic Potential of Bandung City"—seeks to provide an in-depth assessment of the city's digital transformation by addressing the following research questions:

a) What is the overall landscape of digital economy development and policies in Bandung?
b) What challenges does the digital economy face in Bandung?
c) How can the government promote an inclusive and sustainable digital economy in Bandung?

4. SIGNIFICANCE OF THE STUDY

The findings of this study will serve as a strategic foundation for policymakers, industry leaders, and academia in designing targeted policies and programs to accelerate digital adoption and innovation. By identifying sector-specific challenges and opportunities, the study will contribute to the development of a Digital Economy Roadmap for Bandung, ensuring that digital transformation benefits businesses, entrepreneurs, and society at large.

Moreover, the study's insights will highlight the importance of infrastructure investment, digital literacy programs, cybersecurity measures, and public-private partnerships in shaping a resilient, competitive, and inclusive digital ecosystem. As Bandung continues to position itself as a national leader in digital economic development, this research will play a pivotal role in shaping the city's trajectory toward becoming a globally recognized digital hub.

In conclusion, understanding the digital economy's impact at the city level is crucial for designing effective policies that balance economic growth with social inclusion. By leveraging data-driven decision-making and multi-stakeholder collaboration, Bandung has the potential to emerge as a model for sustainable and equitable digital transformation in Indonesia and beyond.

5. LITERATURE REVIEW

5.1. MEASURING THE DIGITAL ECONOMY

Measuring the value and capacity of the digital economy in a region requires careful and structured planning (United Nations Conference on Trade and Development, 2019). The availability of accurate and comprehensive data is also a crucial factor in ensuring that calculations accurately reflect the actual conditions of the digital economy.

A review of various literatures reveals that there is no universally accepted definition of the digital economy. While several sources attempt to provide a clearer framework, significant variations in approach and terminology remain. Therefore, adopting a multidimensional perspective is essential to understanding the digital economy, encompassing aspects such as technology, regulation, and consumer behavior in the digital era.

Three key sources have attempted to identify models for measuring the digital economy. Their descriptions are as follows (Gokhberg et al., 2023) (Bukht & Heeks, 2017) (United Nations Conference on Trade and Development, 2019):

5.1.1. INTERNASIONAL MONETARY FUND (IMF)

The IMF has developed an approach to understanding and measuring the impact of the digital economy. Based on this framework, the IMF clearly distinguishes between the Digital Sector—which includes industries primarily focused on digitalization, the production of information and communication technology (ICT) goods and services, and online platforms supporting the sharing economy—and the broader Digital Economy, where

internet usage permeates all economic sectors without exception.

This distinction is crucial in recognizing that the digital economy is not confined to high-tech industries but also influences traditional sectors such as agriculture, manufacturing, and public services. To conduct its analysis, the IMF utilizes formal administrative data from various institutions and incorporates Big Data to provide in-depth and up-to-date insights into digital economic activities across sectors.

Beyond measuring economic impact, it is also essential to assess digital welfare, which encompasses the non-economic benefits of digitalization. Digital welfare includes various aspects that enhance quality of life, such as improved access to information, greater participation in education and healthcare services, and strengthened social connectivity. Therefore, measuring the digital economy should not only consider its contribution to GDP but also evaluate how digital technology improves overall societal well-being.

According to this measurement model, China's digital economy accounted for 30% of GDP in 2016, while in the United States, it contributed 8.3% of GDP in 2015.

5.1.2. GROUP OF TWENTY (G20)

The G20 does not specifically calculate the value of the digital economy as a separate entity. Instead, it utilizes various existing indicators from multiple sources to formulate policies that support digital economy development. These indicators serve as the foundation for policies that focus on:

1. Development of connectivity infrastructure
2. Empowerment of communities through enhanced digital literacy
3. Broader adoption of technology and innovation
4. Creation of jobs aligned with the demands of the digital economy

Through this approach, the G20 aims to ensure that digital transformation delivers widespread economic and social benefits while mitigating potential risks associated with technological disruption.

5.1.3. ASIAN DEVELOPMENT BANK (ADB)

The Asian Development Bank (ADB) defines the digital economy as an economic system that is not only supported by digital technology but also actively provides digital support. This concept encompasses various aspects, from the use of digital technology in production, distribution, and consumption processes.

To measure the contribution of the digital economy to the overall economy, ADB employs the Leontief Input-Output Table, which enables the analysis of backward and forward linkages between economic sectors. Through this method, the role of the digital economy can be quantified and assessed within the broader economic structure, offering a comprehensive view of how digitalization has penetrated and influenced various sectors.

Figure 1 illustrates the flows and interactions among different economic sectors using two main approaches: production and consumption/expenditure.

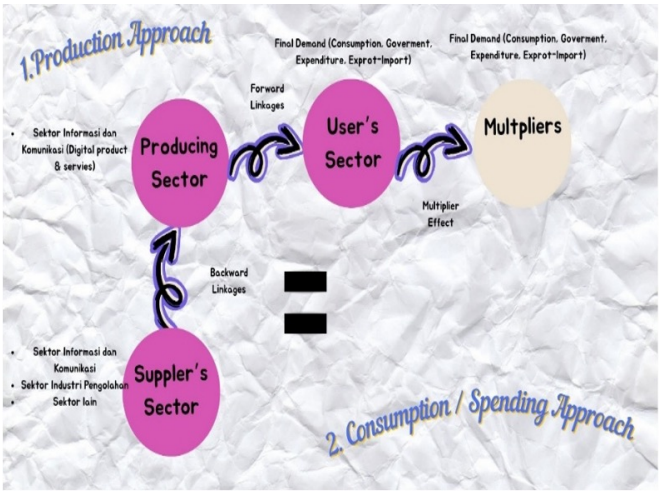

Figure 1. Measuring the Digital Economy Through the Leontief Input-Output Table.

The production approach highlights the relationships between three key sectors:

1. Digital supplier sector – provides essential digital inputs.
2. Digital production sector – serves as the primary producer of digital goods and services.
3. Digital user sector – utilizes digital products for economic activities.

The digital production sector plays a central role in generating digital products, which are then utilized by other sectors. To produce output, this sector relies heavily on inputs from the digital supplier sector, forming backward linkages. Meanwhile, the output generated is subsequently used by the digital user sector, creating forward linkages that drive further economic activities.

The consumption/expenditure approach illustrates how the output consumed by the digital user sector can generate a ripple effect throughout the economy, known as the multiplier effect. When this sector spends on digital goods and services, it not only has a direct impact on the sector itself but also stimulates income growth and increased output in other sectors.

This multiplier effect is crucial because it demonstrates how spending or production in one sector can create widespread economic impacts, ultimately driving overall economic growth. In essence, this model provides a comprehensive understanding of how interactions between different sectors form complex and interdependent value flows, strengthening the economic structure through reciprocal relationships and multiplier effects.

6. FRAMEWORK OF THOUGHT

Within the framework of the digital economy, several key sectors serve as focal points.

1. Production Sector – This sector involves the creation of goods and services, which is increasingly optimized through digital technology. Automation, enhanced efficiency, and improved product quality contribute to greater productivity and competitiveness.
2. Market Access – Digital platforms facilitate broader market reach at a lower cost, enabling businesses to expand their customer base more effectively.
3. Digital Networks and Communities – These play a crucial role in fostering collaboration and enabling the rapid and efficient exchange of information.
4. Digital Payment Systems – Secure and fast digital transactions reduce operational costs and improve financial inclusion.
5. Innovation and Entrepreneurship – Access to digital technology and resources provides a strong impetus for entrepreneurs and startups, creating new business opportunities.

This digital transformation begins with an in-depth analysis of existing economic sectors to identify digitalization needs and opportunities. The needs analysis ensures that each sector receives tailored and relevant digital solutions that not only optimize operations but also enhance market competitiveness.

Government support is a crucial factor in the successful implementation of the digital economy. The government plays a key role in establishing a conducive ecosystem for technological innovation and digital economic growth. This includes collaborations with the private sector through co-creation and co-investment initiatives to accelerate the digitalization process (See **Figure 2**).

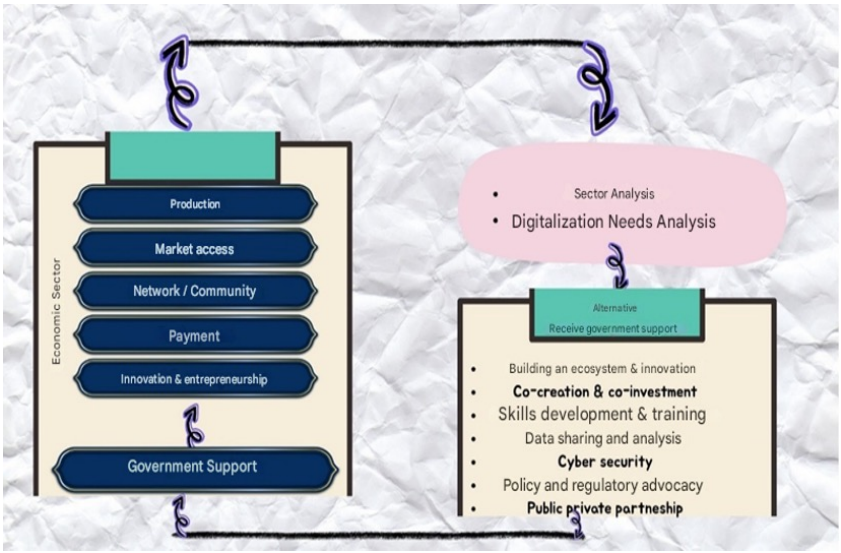

Figure 2. Digital Economy Framework.

Skills development and training are key priorities in fostering digital transformation. Programs aimed at enhancing digital literacy and technical skills among the community and workforce are essential to ensure inclusivity and competitiveness in the digital economy.

Additionally, the government plays a crucial role in:

- First Facilitating data sharing and analysis to support data-driven decision-making.
- Ensuring cybersecurity to protect digital data and systems from potential threats.
- Advocating for policies and regulations that promote a thriving digital economy.

Public-private partnerships (PPP) serve as an effective model for supporting digitalization initiatives, with each party contributing according to their expertise and resources. Through this holistic approach, Bandung is poised to become a model city for inclusive and highly competitive digital transformation.

The synergy between the economic sector, digital technology, and government support fosters an innovative and sustainable ecosystem, creating new opportunities for economic growth and enhancing overall societal well-being.

7. RESEARCH METHODS

Sector analysis is conducted based on several key criteria:

1. Market Orientation – This criterion determines whether a sector primarily serves local, cross-regional, inter-regional, or export markets.
2. Cross-Sector Linkages – This assesses the degree to which a sector interacts with other sectors, both through backward linkages (pull effects from upstream sectors) and forward linkages (push effects toward downstream sectors). The strength of these linkages is measured on a scale from low to high (See **Figure 3**).

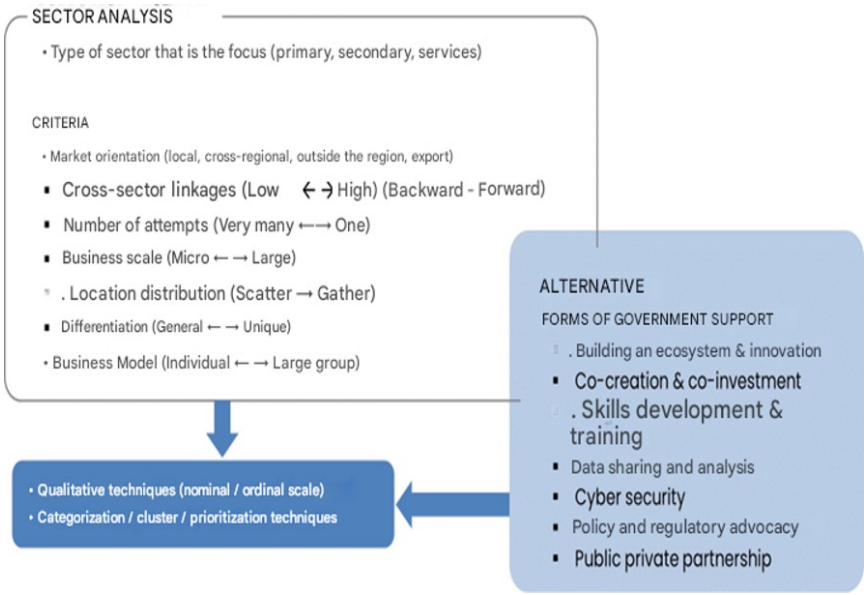

Figure 3. Research Methods.
Source: Processed by Researchers (2025).

Additionally, the number of businesses in each sector is analyzed, ranging from sectors with a high concentration of businesses to those with only a few enterprises. The business scale is also considered, from micro to large enterprises.

The geographical distribution of businesses is examined to determine whether they are widely dispersed or concentrated in specific locations. Another key factor is product or service differentiation, which ranges from common offerings to unique innovations. Furthermore, the business model of each sector is categorized based on whether it comprises individual entrepreneurs or large corporate groups.

To conduct a comprehensive sector analysis, various techniques are employed:

- Qualitative techniques using nominal or ordinal scales to measure qualitative variables (Anderson et al., 2017).

- Categorization techniques, such as clustering and prioritization, to classify sectors based on predefined criteria and establish intervention priorities.

Through this systematic approach, Bandung City is committed to optimizing its digital economic potential. A thorough sector analysis ensures that each industry receives tailored and relevant digital solutions, while government support plays a crucial role in strengthening and accelerating digital transformation. As a result, Bandung is expected to become a model for inclusive and highly competitive digital transformation, fostering new economic growth opportunities and enhancing societal well-being.

The analytical model adopted in this study integrates methodologies from the IMF, ADB, and G20 frameworks, with some operational adjustments, as follows (Ducharme et al., 2018) (Asian Develoment Bank, 2021) (Borowski & Khurana, 2019):

1. IMF Approach:
   - Focuses on the Information and Communication Technology (ICT) Sector as a production sector.
   - Assesses its development over recent years and its contribution to Bandung City's economy.
   - Uses Gross Regional Domestic Product (GRDP) data for analysis.
2. ADB Approach:
   - Examines the Production side of the ICT Sector and its role in supporting the growth of other economic sectors.
   - Utilizes Input-Output (I-O) Table data to analyze inter-sectoral linkages.
3. G20 Approach:
   - Focuses on business actors, specifically their ICT usage levels, types of usage, perceived benefits, and preferences.
   - Employs primary survey data targeting small and medium-sized enterprises (SMEs).

By combining these three approaches, this study aims to provide a comprehensive understanding of the digital economy's role in Bandung City, ensuring that findings are both data-driven and policy-relevant.

8. DATA ANALYSIS PROCESS

The process of data management and analysis plays a fundamental role in supporting evidence-based decision-making for the development of Bandung City's digital economy. This process is structured into four key stages, ensuring that data is collected, processed, analyzed, and reported in a way that provides valuable insights for policymakers, businesses, and other stakeholders. The four stages include Data Collection, Data Management, Data Analysis, and Reporting, each of which contributes to an effective and systematic approach to understanding the digital economy (see **Figure 4**).

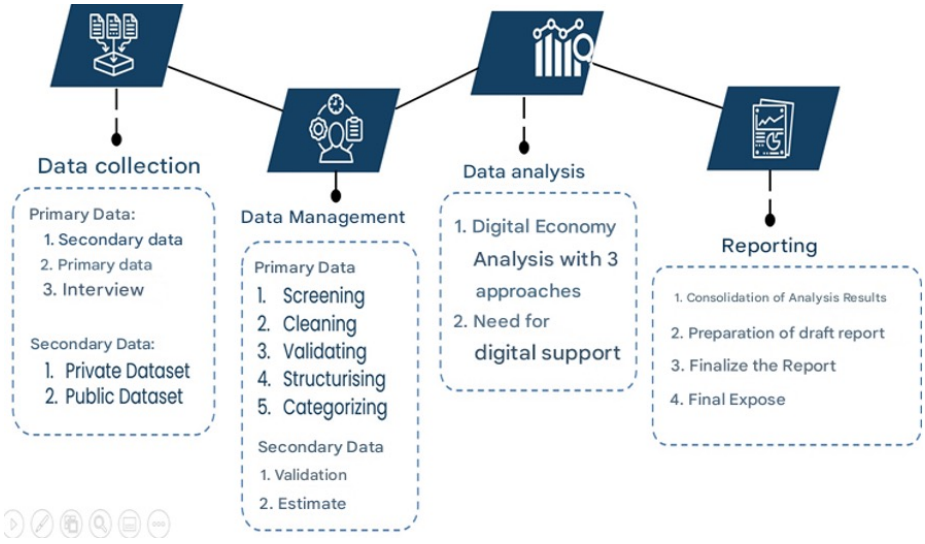

Figure 4. Data Analysis Process.
Source: Processed by Researchers (2025).

The first stage involves gathering data from various reliable sources to create a strong foundation for analysis. The data is sourced from three main categories:

- Primary Surveys – Conducted through direct engagement with individuals and businesses, these surveys provide firsthand information on digital adoption, business practices, infrastructure usage, and economic activities related to digital transformation in Bandung City.
- Administrative Records – Data collected from government agencies, municipal offices, and regulatory institutions, which includes tax records, business licenses, and digital service registrations, offering insights into the formal aspects of the digital economy.
- Digital Platforms – Information extracted from e-commerce sites, digital transactions, social media, and online marketplaces, which help measure digital business activities, consumer trends, and technology penetration.

By combining multiple data sources, this approach ensures a comprehensive and multidimensional understanding of Bandung's digital economy.

8.1. DATA COLLECTION

The first stage in the data management process is data collection, which serves as the foundation for analyzing Bandung City's digital economy. This stage involves gathering information from various sources to ensure that the study is based on diverse and reliable data. To achieve a comprehensive understanding, the collected data is categorized into two main types: primary data and secondary data.

Primary data is obtained directly from respondents through interviews. This method involves structured or semi-structured interviews with key stakeholders, including government officials, business owners, digital entrepreneurs, and industry experts. The goal of these interviews is to collect both qualitative and quantitative insights, allowing researchers to understand current digital trends, challenges, and opportunities in Bandung City. By engaging directly with respondents, the study captures firsthand experiences and perspectives, which are crucial for shaping a realistic and data-driven analysis.

In addition to primary data, secondary data plays a critical role in enriching the study. It is sourced from two main categories:

1. Private Datasets – These datasets are owned by specific organizations, research institutions, or private companies. Access to private data often requires authorization or formal agreements due to confidentiality and proprietary concerns. However, private datasets are highly valuable because they provide in-depth insights into industry trends, digital adoption rates, and sectoral contributions to the economy.
2. Public Datasets – These are openly available data sources provided by government agencies, international organizations, academic institutions, and open-access databases. Public datasets offer essential macroeconomic indicators, such as regional GDP (GRDP), employment statistics, digital infrastructure penetration, and consumer behavior patterns. Because they are readily accessible, public datasets serve as a reliable and cost-effective foundation for assessing the overall digital economy landscape in Bandung City.

By integrating both primary and secondary data, this structured approach ensures that the study leverages a broad spectrum of information sources, ultimately enhancing the reliability and depth of the findings. Through comprehensive data collection, researchers can develop a holistic view of Bandung City's digital economy, identifying its strengths, challenges, and areas for further growth.

8.2. DATA MANAGEMENT

In studying the potential of the digital economy in Bandung City, data management plays a crucial role in ensuring that the information collected can be effectively utilized for analysis and decision-making. The data management process consists of four main stages: data collection, data management, data analysis, and reporting. These stages are designed to ensure that the data used is relevant, accurate, and capable of providing deep insights into the development of the digital economy in Bandung City.

The first stage of this process is data collection, which involves gathering information from various sources. The collected data is categorized into two main types: primary data and secondary data. Primary data is obtained directly through methods such as interviews with key stakeholders, surveys of digital business actors, and observations of various aspects of the growing digital economy in Bandung City. This type of data allows researchers to gain first-hand insights from economic players and stakeholders involved in the digital transformation.

On the other hand, secondary data is sourced from various existing datasets, either public or private. Public

datasets include freely accessible data, such as official reports from government agencies, academic research findings, or publications from international organizations related to the digital economy. Meanwhile, private datasets are owned by specific institutions or companies and typically require special permissions for access. Secondary data serves as a supporting source that provides a broader context for the findings obtained from primary data.

Once data collection is complete, the next stage is data management, which ensures that the collected data is clean, accurate, and ready for further analysis. This process involves several critical steps, particularly in managing primary data and secondary data.

For primary data management, the following steps are undertaken:

1. Screening – Reviewing collected data to identify and remove irrelevant or erroneous information.
2. Cleansing – Cleaning the data to eliminate inconsistencies, duplications, or recording errors.
3. Validating – Verifying the accuracy and reliability of the collected data to ensure its suitability for research purposes.
4. Structuring – Organizing data in a systematic format to facilitate analysis.
5. Categorizing – Grouping data into relevant categories to enable thematic analysis.

In managing secondary data, two key steps are carried out:

1. Validating – Assessing whether the obtained secondary data meets accuracy standards and is relevant to the research needs.
2. Estimating – If available data is insufficient, an estimation process is conducted, or proxy data is generated based on predefined parameters to provide a representative overview.

This structured data management process ensures that all information used in the study of Bandung City's digital economy accurately reflects real conditions in the field. Well-managed data forms a solid foundation for further analysis, whether in assessing the economic impact of digitalization, identifying opportunities and challenges, or designing policies that support the growth of the digital ecosystem in Bandung City.

The final stage of data management is analysis and reporting, where the processed data is analyzed using various quantitative and qualitative methods. The results of this analysis are then compiled into a report that can be utilized by various stakeholders, including local government, business actors, academics, and digital communities, to formulate strategic steps for optimizing the digital economy in Bandung City.

Overall, this approach not only ensures that the data used in the research is of high quality but also helps create a more transparent and data-driven decision-making system for digital economic development. With effective data management, Bandung City is expected to serve as a model for other cities in developing an inclusive and highly competitive digital ecosystem.

8.3. DATA ANALYSIS

The third stage in the data management process is data analysis, where the structured and validated data is examined to extract meaningful insights that can guide decision-making. This stage is essential in understanding the current state of the digital economy, identifying gaps and opportunities, and formulating strategic recommendations.

8.3.1. DIGITAL ECONOMY ANALYSIS

The digital economy is analyzed using three globally recognized approaches, namely those proposed by the International Monetary Fund, the Asian Development Bank, and the G20.

The IMF approach focuses on assessing the Information and Communication Technology (ICT) sector as a core driver of digital transformation. This approach evaluates the sector’s growth trends, economic contribution, and productivity using Gross Regional Domestic Product (GRDP) data for Bandung City.

The ADB approach investigates the interlinkages between the ICT sector and other economic sectors through Input-Output (I-O) Table analysis. Backward and forward linkages are analysed to determine the extent to which digitalization supports and amplifies wider economic activity.

The G20 approach examines digital adoption among business actors, with particular emphasis on small and medium sized enterprises. This analysis is based on primary survey data and considers level of ICT usage, digital business practices, perceived benefits of digitalisation, and technology preferences.

The integration of these three approaches enables a comprehensive assesment of digitalization trends, economic impact, and the degree of digital integration across key sectors in Bandung City.

8.3.2. IDENTIFICATION OF DIGITAL SUPPORT NEEDS

To ensure the digital economy reaches its full potential, the study identifies sector-specific digital support requirements. These needs are mapped out in a Digital Economy Roadmap, which highlights the following key areas:

- Technology Infrastructure – Assessing the availability and accessibility of broadband connectivity, cloud computing, and digital platforms to support digital economic activities.
- Digital Skills Training – Identifying skill gaps and developing targeted training programs to enhance the digital literacy, technical capabilities, and cybersecurity awareness of the workforce.
- Cybersecurity Measures – Evaluating the readiness of businesses and government institutions in adopting secure digital transactions, data protection mechanisms, and risk management frameworks to ensure a resilient digital ecosystem.

By systematically analyzing these factors, Bandung City can develop data-driven policies and investment strategies that foster an inclusive and competitive digital economy.

8.4. REPORTING

The final stage focuses on presenting insights in a clear, actionable, and policy-oriented manner. The results of data analysis are disseminated through various formats, including:

- Comprehensive Reports – Detailed research papers and official documents that summarize findings and policy recommendations.
- Interactive Dashboards – Visual tools that allow stakeholders to explore real-time data and key performance indicators (KPIs) related to the digital economy.
- Policy Briefs – Concise, targeted documents designed to inform government officials and business leaders on specific strategic actions to enhance digital economic growth.

By structuring the reporting process effectively, the findings become accessible, interpretable, and actionable, ensuring that decision-makers can implement informed policies to drive Bandung City's digital transformation.

9. RESULT AND DISCUSSION

9.1. ANALYSIS OF INDONESIA'S DIGITAL ECONOMY

9.1.1. CONDITION OF INDONESIA'S DIGITAL ECONOMY

Indonesia has established itself as the largest digital economy in the ASEAN region for two consecutive years, reflecting the country's rapid adoption of digital technology and its increasing economic reliance on digital transactions. In 2022, Indonesia recorded a digital economy value of USD 76 billion, demonstrating its strong position in the regional market. This upward trajectory continued into 2023, with a 7.8% growth rate, bringing the total digital economy value to USD 82 billion. This consistent expansion highlights Indonesia's resilience and adaptability in leveraging digital innovations to drive economic progress.

Looking ahead, Indonesia's digital economy is projected to maintain its dominance in the ASEAN region, with significant growth anticipated by 2025. Even under a low-expectation scenario, Indonesia's digital economy is expected to reach USD 109 billion, surpassing all other ASEAN countries by a substantial margin. This projection underscores the nation's robust digital infrastructure development, increasing internet penetration, rising adoption of e-commerce, and expanding fintech ecosystem.

When compared to other ASEAN economies, Thailand is expected to secure the second position in the region with a projected digital economy value of USD 100 billion by 2025. Vietnam follows closely behind with an estimated USD 90 billion, reflecting its strong government policies supporting digital transformation and the rise of tech startups. The Philippines is projected to reach USD 80 billion, benefitting from the rapid adoption of digital financial services and a booming e-commerce sector. Meanwhile, Malaysia is expected to record USD 45 billion, showing steady growth but at a more moderate pace due to its smaller market size. Singapore, despite being a global technology hub, is projected to reach USD 40 billion, which is relatively lower compared to its regional counterparts due to its smaller population size and market constraints (see

Figure 5).

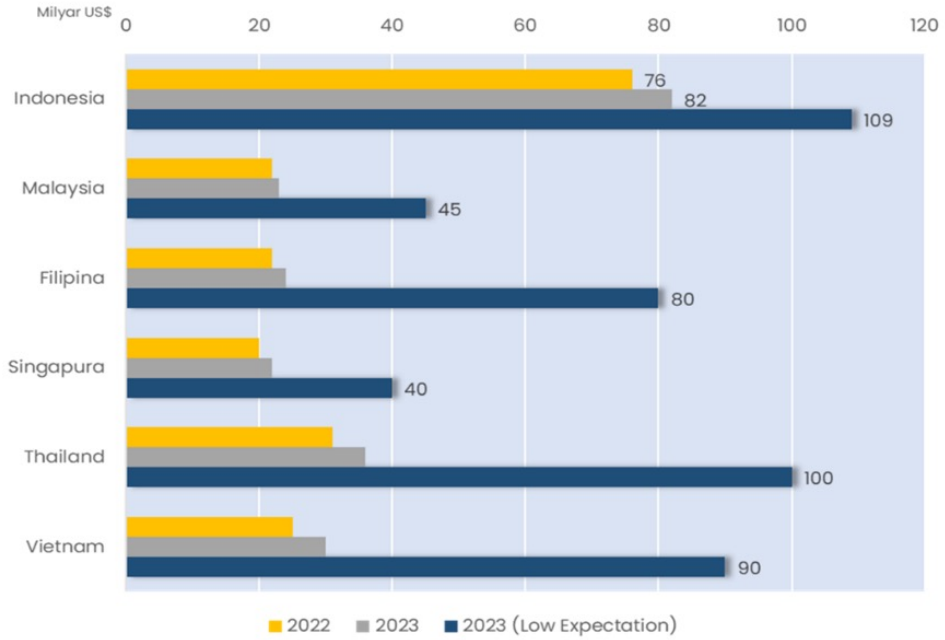

Figure 5. Digital Economy Value in ASEAN.
Source: E-Conomy SEA 2023 Report Indonesia.

The dominance of Indonesia's digital economy is largely attributed to several key factors. First, its large and digitally active population provides a substantial consumer base for digital platforms. Second, government initiatives supporting digital transformation, such as the National Digital Economy Framework and Smart City programs, have accelerated the adoption of technology across industries. Third, the rapid expansion of e-commerce, fintech, and digital banking services has fueled market growth, making Indonesia a key player in the digital economy landscape.

However, despite these impressive achievements, Indonesia must address several challenges to sustain its growth momentum. These include improving digital infrastructure in rural areas, enhancing cybersecurity measures, increasing digital literacy, and fostering an inclusive digital economy that benefits all socio-economic groups. Overcoming these challenges will be crucial for Indonesia to not only maintain its leading position in ASEAN but also to establish itself as a major global player in the digital economy.

By leveraging strategic investments, policy support, and technological advancements, Indonesia is well-positioned to further expand its digital economy, driving innovation, job creation, and long-term economic prosperity in the years to come.

9.1.2. PROJECTION OF INDONESIA'S DIGITAL ECONOMY VALUE (GMV)

The value of Indonesia's digital economy can be assessed using the Gross Merchandise Value (GMV) calculation method, which measures the total sales value of goods and services transacted over a specific period. GMV serves as a key indicator of digital economic growth, particularly in sectors such as e-commerce, digital payments, online services, and financial technology (fintech). As digital adoption continues to expand across Indonesia, GMV is expected to demonstrate consistent and significant growth, further solidifying Indonesia's position as a leading digital economy in the ASEAN region (See **Figure 6).**

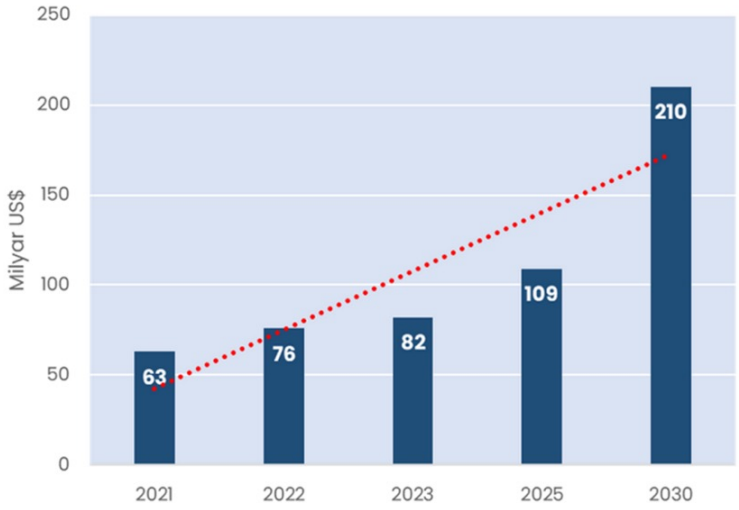

Figure 6. Projection of Indonesia's Digital Economy Value (GMV).
Source: E-Conomy SEA 2023 Report Indonesia.

According to recent projections, Indonesia's GMV in 2022 served as a baseline for forecasting future digital economic growth. By 2023, Indonesia's GMV was estimated to increase by 8%, reaching a total value of USD 82 billion. This steady expansion reflects the continued increase in digital transactions, higher consumer demand for online services, and the growing contribution of micro, small, and medium enterprises (MSMEs) in the digital landscape.

Looking further ahead, Indonesia's GMV is projected to grow by 15% in 2024, reaching an estimated USD 109 billion. This acceleration indicates that Indonesia's digital infrastructure and digital business ecosystem are maturing, supported by the rapid adoption of cloud computing, artificial intelligence, blockchain, and data-driven services across industries. The increasing trust and reliance on digital financial services, e-commerce platforms, and digital logistics solutions also contribute to this strong growth trajectory.

Over the next five years, Indonesia's GMV is forecasted to expand by approximately 3.5 times, reaching an estimated USD 210 billion by 2030. This long-term growth projection underscores the vast potential for digital business models, technological innovation, and cross-sector digital integration in Indonesia. The expected surge in mobile transactions, cashless payments, digital banking adoption, and the gig economy will further fuel GMV expansion. Additionally, the government's continuous push for smart city initiatives, digital inclusion programs, and regulatory support for digital startups will play a crucial role in fostering a sustainable and inclusive digital economic ecosystem.

With this rapid growth trajectory, Indonesia is poised to strengthen its role as a major market and producer in the global digital economy. The country's large population, increasing internet penetration, and highly active digital consumers provide a competitive advantage in scaling digital businesses. Moreover, Indonesia's ability to attract foreign investments in technology startups, digital finance, and innovation-driven industries will further enhance its position as a regional and global leader in the digital economy.

However, to fully realize its potential, Indonesia must address key challenges, including bridging the digital divide between urban and rural areas, improving digital literacy, ensuring cybersecurity resilience, and fostering a regulatory environment that encourages innovation while ensuring fair competition. Strategic policies and investments in digital infrastructure, workforce development, and public-private collaboration will be critical in ensuring that Indonesia's digital economy growth remains sustainable and inclusive for all segments of society.

By maintaining a proactive approach to digital transformation and leveraging technological advancements, Indonesia can maximize its digital economy potential, drive economic resilience, and establish itself as a global digital powerhouse by 2030.

9.1.3. NUMBER OF NATIONAL INTERNET USER INDIVIDUALS

Over the past decade, Indonesia has experienced a rapid increase in internet adoption, driven by advancements in digital infrastructure, the widespread availability of mobile networks, and the growing affordability of internet services. Since 2014, the number of internet users in Indonesia has quadrupled, reaching approximately 185 million in 2024 (see **Figure 7**). This significant growth indicates a transformation in how Indonesians interact with digital platforms, engage in e-commerce, and participate in online

communication. However, as internet penetration nears saturation—particularly among the population aged 16 to 64—the rate of new user growth has begun to slow. Instead of acquiring new users at the same pace as before, future expansion will likely be fueled by increased data consumption per user, greater diversification of online activities, and improvements in internet accessibility in rural areas.

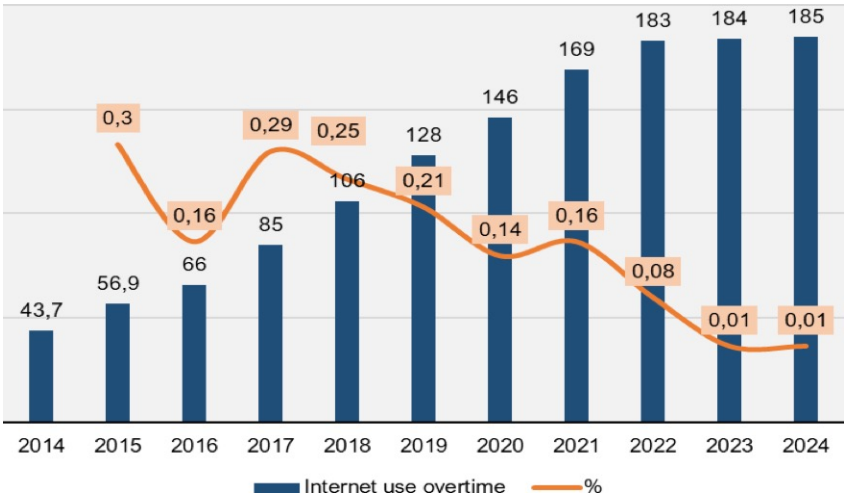

Figure 7. Number of Internet Users (YoY) (In Million).

Among the various devices used to access the internet, mobile phones have emerged as the dominant choice for Indonesians. In 2023, approximately 62.76% of users accessed the internet primarily through their smartphones, significantly outpacing the use of computers or laptops (36.90%) and tablets (0.35%). Several factors contribute to this preference for mobile devices. Firstly, mobile phones offer greater portability and convenience, allowing users to stay connected anywhere and at any time. Additionally, mobile phones provide seamless internet access through wireless networks, making them more practical compared to traditional computers, which often require fixed broadband connections. Affordability also plays a crucial role, as smartphones are available in a wide range of price segments, making them accessible to a broader demographic. Furthermore, the mobile-first nature of many digital services in Indonesia, including e-commerce platforms, social media applications, and fintech solutions, has reinforced the preference for mobile internet usage.

Despite the dominance of mobile devices, computers and laptops continue to play an important role, particularly for professional and academic purposes that require larger screens and more advanced processing capabilities. However, tablets remain a niche device, accounting for only a small percentage of internet access due to their higher cost and competition with both smartphones and laptops.

Looking ahead, several trends are expected to shape the future of internet usage in Indonesia. The expansion of 5G networks will enhance internet speed and reliability, further improving the digital experience for users. Additionally, the growth of digital financial services, such as mobile banking and e-wallets, will accelerate financial inclusion, allowing more Indonesians to participate in the digital economy. As artificial intelligence (AI) and the Internet of Things (IoT) become more integrated into daily life, mobile devices will serve as essential tools for automation, smart applications, and personalized digital experiences.

However, challenges remain in ensuring equitable digital access across all regions. While urban areas benefit from well-developed infrastructure, rural and remote communities still face barriers to connectivity. Addressing this digital divide requires collaborative efforts between the government and private sector to expand network coverage, lower internet costs, and implement digital literacy programs. Additionally, as reliance on digital platforms increases, issues related to cybersecurity and data privacy must be prioritized to create a safer and more trustworthy online environment.

Overall, the widespread use of mobile phones for internet access in Indonesia reflects the country's evolving digital landscape and its transition into a mobile-first economy. With continuous advancements in technology, infrastructure, and digital services, Indonesia is well-positioned to maximize the benefits of its digital economy. However, ensuring sustainable and inclusive growth will require ongoing efforts to improve accessibility, enhance digital skills, and strengthen cybersecurity measures to support a resilient and future-ready digital society.

9.1.4. TOP TYPES OF WEBSITES AND APPLICATIONS MOST VISITED AND USED

In 2023, the digital behavior of Indonesians continued to evolve, with certain web and application categories emerging as the most frequently visited and utilized. **Figure 8** illustrates that social networking platforms dominated online activity, with an overwhelming 98.4% of users engaging in social media. This trend underscores the central role of social networks in everyday digital interactions, from communication and content sharing to entertainment and business promotion. The near-universal adoption of social media in Indonesia reflects the increasing reliance on these platforms not only for personal connections but also for professional networking, digital marketing, and community engagement.

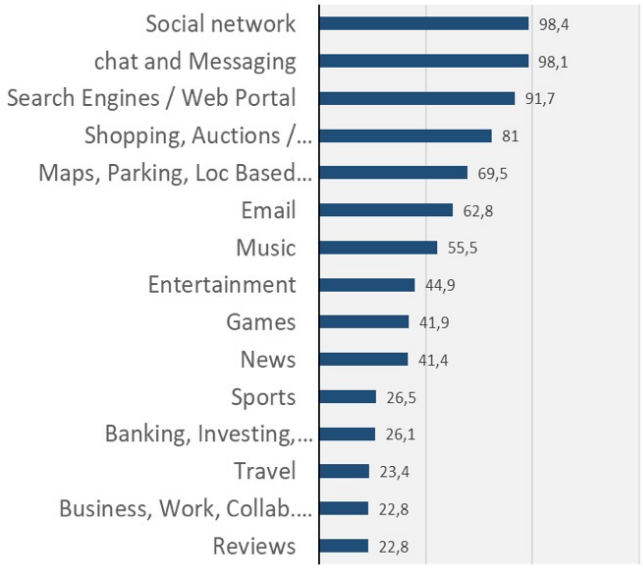

Figure 8. Top Types of Websites Visited and Applications Used by Indonesians.
Source: Reportal Data (2025)

Closely following social networks, chat and messaging applications ranked as the second most-used category, with 98.1% of users relying on these platforms for instant communication. The widespread use of messaging apps highlights the growing preference for fast, convenient, and cost-effective digital communication. With features such as voice and video calls, multimedia sharing, and business integration, messaging applications have become indispensable tools for both personal and professional interactions. Businesses, particularly in the micro, small, and medium enterprise (MSME) sector, leverage these platforms to engage with customers, facilitate transactions, and provide customer support.

Search engines and web portals ranked third, with 91.7% of internet users relying on them for information retrieval, navigation, and accessing online content. This statistic underscores the fundamental role of search engines in shaping digital experiences, enabling users to explore a vast array of information, products, and services efficiently. The heavy dependence on search engines reflects the increasing demand for quick and accurate access to knowledge, whether for educational purposes, business research, or everyday problem-solving.

E-commerce and online shopping applications ranked fourth, with 81% of users engaging in digital retail activities. This significant adoption of online shopping platforms highlights the rapid growth of Indonesia's e-commerce sector, fueled by factors such as increased internet penetration, mobile payment adoption, and improved logistics infrastructure. Consumers are increasingly turning to digital marketplaces for convenience, product variety, competitive pricing, and promotional discounts. The rise of social commerce—where purchases are made directly through social media platforms—has further contributed to the expansion of online shopping in Indonesia.

Lastly, applications related to maps, parking, and location-based services ranked fifth, with 69.5% of users utilizing these tools for navigation, transportation, and urban mobility. The widespread use of these applications reflects the growing reliance on digital solutions for daily commuting, travel planning, and real-time location tracking. The integration of geolocation technology in various sectors, including ride-hailing services, food delivery, and logistics, has reinforced the importance of location-based digital tools in

Indonesia's digital economy.

Overall, these top five web and app categories demonstrate the diverse ways in which Indonesians engage with digital platforms. The dominance of social media and messaging applications highlights the social and communicative nature of internet usage, while the prominence of search engines, e-commerce platforms, and location-based services underscores the increasing integration of digital technology into everyday life. As digital adoption continues to grow, these trends are expected to shape the future of Indonesia's digital economy, driving innovation, business transformation, and consumer behavior in the coming years.

9.1.5. MAIN REASONS FOR USING THE INTERNET

The widespread use of the internet in Indonesia is driven by diverse motivations, reflecting the growing role of digital connectivity in everyday life. As illustrated in **Figure 9**, the primary reason for internet usage among Indonesians is to seek information, with 83.1% of users relying on digital platforms for knowledge acquisition. This trend underscores the internet's role as a critical source of learning, research, and professional development. Whether searching for educational materials, consumer product reviews, or industry insights, users leverage online resources to make informed decisions in various aspects of life, including business, health, and personal finance.

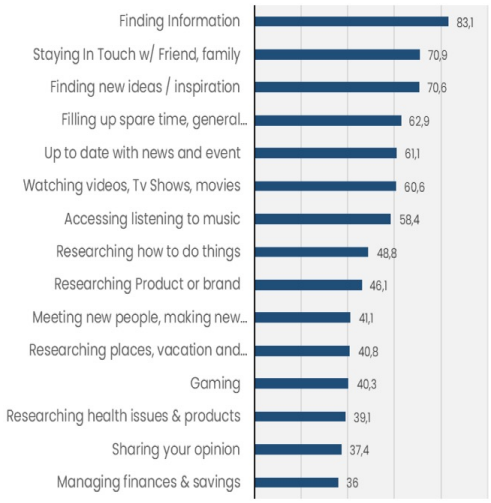

Figure 9. Main Reasons for Using the Internet.
Source: Reportal Data (2025)

Maintaining social connections is another major driver of internet usage, with 70.9% of Indonesians using online platforms to stay connected with friends and family. The increasing dependence on social networking sites and messaging applications reflects the need for real-time communication and interaction, particularly in an era where digital engagement has become a fundamental aspect of social life. The availability of video calls, group chats, and social media communities enables users to foster relationships regardless of geographical barriers, reinforcing the internet's role in enhancing social cohesion.

A significant portion of Indonesian internet users (70.6%) also turn to online platforms for inspiration and new ideas. Whether for creative endeavors, business strategies, or personal projects, the internet serves as an endless repository of innovation. Entrepreneurs and professionals often explore digital resources for insights on emerging market trends, innovative business models, and creative problem-solving approaches. The accessibility of diverse content, from blogs and tutorial videos to expert discussions and webinars, allows individuals to broaden their perspectives and enhance their knowledge.

Additionally, 62.9% of users go online to fill their free time, engaging with entertainment content such as videos, music, gaming, and social media. The rising popularity of digital entertainment platforms indicates a shift in consumer behavior, where traditional media consumption is increasingly replaced by on-demand digital content. Streaming services, interactive media, and online gaming communities continue to shape the digital entertainment landscape, driving engagement across various demographics.

Keeping up with current events is another key motivation for internet usage, with 61.1% of users relying on digital sources for news and updates. The rapid dissemination of information through online news portals,

social media, and video platforms enables users to stay informed about local and global developments. However, this trend also highlights the need for digital literacy, as the abundance of information requires users to critically assess sources and verify the accuracy of content before sharing or acting upon it.

Ultimately, these diverse motivations for internet usage contribute to the expansion of Indonesia's digital economy. Activities such as researching shopping trends, analyzing consumer behavior, implementing digital marketing strategies, developing fintech applications, securing digital funding, obtaining digital certifications, and producing online content all play a role in strengthening the digital ecosystem. As internet access becomes increasingly widespread, its impact on economic productivity, innovation, and entrepreneurship is expected to grow, further reinforcing Indonesia's position as a leader in the ASEAN digital economy.

9.2. DIGITAL ECONOMY ANALYSIS OF BANDUNG CITY

9.2.1. DIGITAL ECONOMY ANALYSIS (IMF APPROACH)

The information and communication sector has demonstrated remarkable performance with consistent growth year after year, as illustrated in **Table 1**. This sector plays a crucial role in Bandung City's economic structure, serving as a key driver of digital transformation and a pillar of economic resilience.

Table 1. Information and Communication Sector in Bandung City's GRDP (IDR Billion)

Sector	2018	2019	2020	2021	2022	2023
Agriculture	297	300	287	292	306	309
Processing industry	50.261	53.848	55.294	57.998	62.481	65.798
Electricity and Gas Procurement	254	264	244	260	292	303
Water Supply etc.	482	494	543	590	636	646
Construction	23.719	26.123	23.989	25.486	27.531	28.927
Vehicle Trading and Repair	69.776	76.469	71.853	75.215	83.429	88.963
Transportation and Warehousing	30.599	31.238	21.046	20.143	25.447	28.264
Accommodation & Food & Drink	13.182	14.254	12.466	13.022	15.488	16.594
Information and Communication	26.515	29.168	40.213	43.935	47.325	51.608
Financial Services and Insurance	15.644	17.230	18.158	19.012	20.428	21.350
Real Estate	2.898	3.186	3.329	3.664	3.990	4.222
Corporate Services	2.061	2.537	2.414	2.580	3.036	3.336
Government Administration etc.	6.977	7.751	7.845	7.931	7.762	7.882
Educational Services	9.026	10.846	12.223	12.719	13.542	14.524
Health Services and Social Activities	2.897	3.293	3.303	3.663	4.098	4.609
Other services	9.807	11.460	10.419	10.606	12.361	13.951
GRDP	264.393	288.461	283.627	297.116	328.151	351.284

Source: Badan Pusat Statistik, 2024.

One of the most significant milestones for this sector occurred in 2020, when it recorded an exceptional growth rate of 37.87%. This surge was largely attributed to the COVID-19 pandemic, which drastically increased society's dependence on digital technology. With widespread remote work, online learning, digital communication, and e-commerce adoption, the demand for internet services, cloud computing, digital applications, and telecommunications infrastructure skyrocketed. Unlike many other sectors that faced disruptions and contractions during the pandemic, the information and communication sector not only remained resilient but also experienced unprecedented expansion.

Beyond simply responding to heightened demand, this sector demonstrated exceptional adaptability by quickly innovating and expanding services to meet emerging digital needs. Its ability to function as an economic enabler was evident, as it played a vital role in sustaining business operations, government services, and educational institutions during lockdown periods. The strengthened reliance on digital solutions further reinforced this sector's importance, ensuring that economic activities in Bandung City could continue despite movement restrictions and social distancing measures.

As a result, the information and communication sector has solidified itself as a fundamental component of Bandung City's economic landscape. Even beyond the pandemic-driven surge, the sector maintained strong momentum, contributing significantly to Gross Regional Domestic Product (GRDP). By 2023, it accounted for 14.69% of Bandung City's total GRDP, underscoring its long-term economic significance and its role in shaping the city's technological and economic future.

Looking ahead, the continued expansion of digital infrastructure, the rise of tech startups, increasing digital literacy, and government-led smart city initiatives are expected to further strengthen the sector's contribution to economic growth. As Bandung City continues to position itself as a hub for digital innovation, the information and communication sector will remain a driving force behind sustainable development, technological advancement, and economic competitiveness.

The information and communication sector has demonstrated remarkable performance, consistently recording strong growth each year, as illustrated in Table 1. Among its peak periods of expansion, 2020 marked the highest growth rate at 37.87%, primarily driven by the increased reliance on digital technology during the COVID-19 pandemic. As businesses, educational institutions, and individuals adapted to remote work, online learning, and digital communication, the demand for internet services, digital platforms, and telecommunication infrastructure surged significantly. This rapid acceleration highlighted the sector's crucial role as an economic enabler, ensuring that various industries remained operational despite the constraints of physical distancing measures.

One of the key strengths of the information and communication sector is its ability to quickly adapt to evolving demands, particularly during periods of crisis. The pandemic underscored the sector's resilience and flexibility, as it responded to increased demands for video conferencing tools, cloud computing services, e-commerce platforms, and cybersecurity solutions. Additionally, government and private sector initiatives to enhance digital connectivity, broadband expansion, and ICT literacy further strengthened the sector's position as a critical driver of economic sustainability. By facilitating seamless communication and enabling digital transformation across industries, the sector played a pivotal role in mitigating economic disruptions and maintaining business continuity.

Beyond its exceptional growth during the pandemic, the information and communication sector continues to serve as one of the main pillars of Bandung City's economy. Its contribution to Gross Regional Domestic Product (GRDP) has remained substantial, reflecting its importance in sustaining economic momentum and driving regional competitiveness. By 2023, the sector accounted for 14.69% of Bandung City's total GRDP, reinforcing its integral role in the regional economic structure. This strong contribution is a testament to Bandung's rapid digitalization, thriving tech ecosystem, and increasing reliance on digital services across public and private sectors.

Looking ahead, the information and communication sector is expected to maintain its upward trajectory, fueled by continuous advancements in technology, expanding digital infrastructure, and increasing investments in ICT innovation. As Bandung positions itself as a smart city and a hub for digital entrepreneurship, the sector's growth will be further supported by emerging technologies such as 5G, artificial intelligence (AI), big data analytics, and the Internet of Things (IoT). By leveraging these innovations, Bandung can further enhance its digital economy, improve public services, and strengthen its global competitiveness.

In conclusion, the information and communication sector has become a cornerstone of Bandung's economic development, not only as a high-performing industry but also as a catalyst for digital transformation across multiple sectors. Its sustained growth and significant contribution to GRDP underscore its strategic importance in shaping the city's future economic landscape, making it a key priority for policy development, infrastructure investment, and talent development initiatives in the years to come.

The information and communication sector has emerged as a key driver of Bandung City's economy, contributing an average of 14.7% to Gross Regional Domestic Product (GRDP), as illustrated in **Figure 10**. This substantial contribution places it among the top three economic sectors, each of which consistently contributed more than 10% to GRDP during the 2018-2023 period. The sector's steady and significant presence highlights its critical role in shaping the city's economic landscape, particularly in the era of digital transformation.

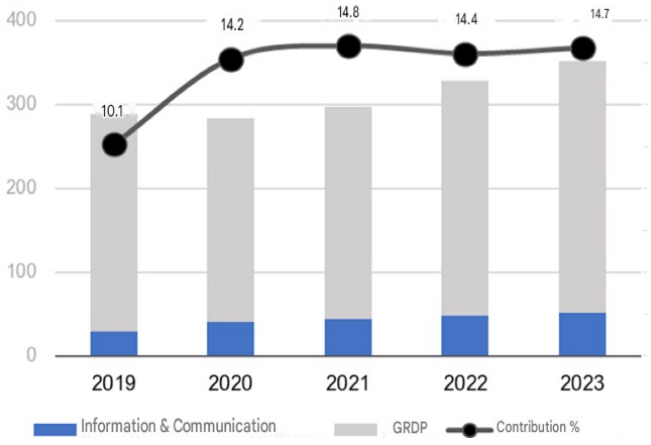

Figure 10. Development of the Contribution of the Information and Communication Sector to the GRDP of Bandung City (%).

The strong correlation between the information and communication sector and digital development further emphasizes its strategic importance in sustaining economic growth. The rapid expansion of internet infrastructure, the proliferation of digital platforms, and increasing digital adoption across industries have positioned this sector as a cornerstone of economic progress. Businesses, government institutions, and individuals alike increasingly rely on digital services for communication, commerce, and productivity, reinforcing the sector's enduring relevance.

This growth is not only driven by technological advancements but also by supportive policies and investments in digital infrastructure. Initiatives such as smart city programs, digital literacy campaigns, and incentives for tech startups have further fueled the expansion of the digital economy, making the information and communication sector a key enabler of innovation and economic resilience.

As Bandung City continues to strengthen its position as a regional technology hub, the information and communication sector is expected to play an even greater role in shaping future economic trends. With rising digitalization across industries, the acceleration of e-commerce, and increasing demand for cloud computing and artificial intelligence (AI) solutions, this sector is poised to drive sustained economic growth and competitiveness in the years to come.

9.2.2. DIGITAL ECONOMY ANALYSIS (ADB APPROACH)

The Leontief coefficient, which is fundamental in this analysis, is derived from the 2016 Input-Output Table. This coefficient helps in measuring the interdependencies between economic sectors, particularly in assessing how inputs from one sector contribute to the output of another. In this case, the output value of the Information and Communication sector is determined based on the 2023 GRDP of Bandung City at current prices.

In 2023, the Information and Communication sector contributed a significant added value of IDR 51.5 trillion to the city's GRDP. This added value represents the sector's role in producing goods and services for final consumption, investment, and export (see **Figure 11).** The sector's economic significance is not only reflected in its direct output but also in its linkages with other industries, as it serves as a key enabler of digital transformation across multiple economic activities.

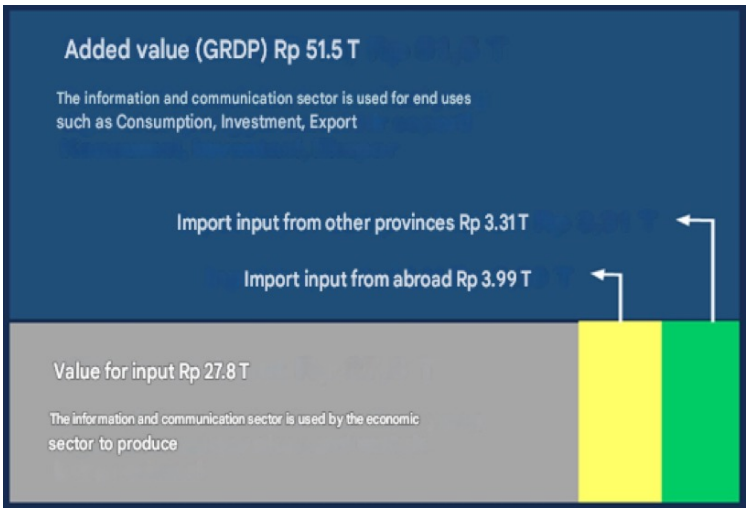

Figure 11. Digital Sector Production Using Input – Output Table (Leontief) in the Information and Communication Sector

The production process within this sector relies on various input sources, amounting to a total value of IDR 27.8 trillion. These inputs are essential in sustaining digital infrastructure, supporting digital businesses, and enhancing technological capabilities. The input sources can be classified into two main categories:

1. Inter-provincial imports: Bandung City's Information and Communication sector imports inputs from other provinces in Indonesia, with a total value of IDR 3.31 trillion.
2. International imports: The sector also relies on imported inputs from abroad, amounting to IDR 3.99 trillion. These imported components include hardware, software, digital services, and other technological resources essential for digital infrastructure development.

The significant reliance on imported inputs suggests that Bandung's Information and Communication sector is highly integrated into both the national and global supply chains. While this dependence on external inputs highlights the importance of foreign technology and digital services, it also underscores the need for local industry development to reduce reliance on imports and enhance domestic digital innovation.

Looking ahead, strengthening local digital production capabilities, investing in research and development (R&D), and fostering collaboration between local tech firms and global digital players will be crucial strategies to enhance the sector's self-sufficiency and competitiveness. By doing so, Bandung City can further capitalize on its digital economy potential, positioning itself as a leading tech-driven urban center in Indonesia and Southeast Asia.

9.2.3. DIGITAL ECONOMY ANALYSIS (G20 APPROACH)

The data presented in **Figure 12** highlights the dominance of the food and beverage (F&B) sector, which accounts for 48% of all SMEs in Bandung City. This significant share indicates that almost half of the small and medium enterprises (SMEs) in the city are engaged in the food and beverage industry, making it the largest contributor to the SME landscape.

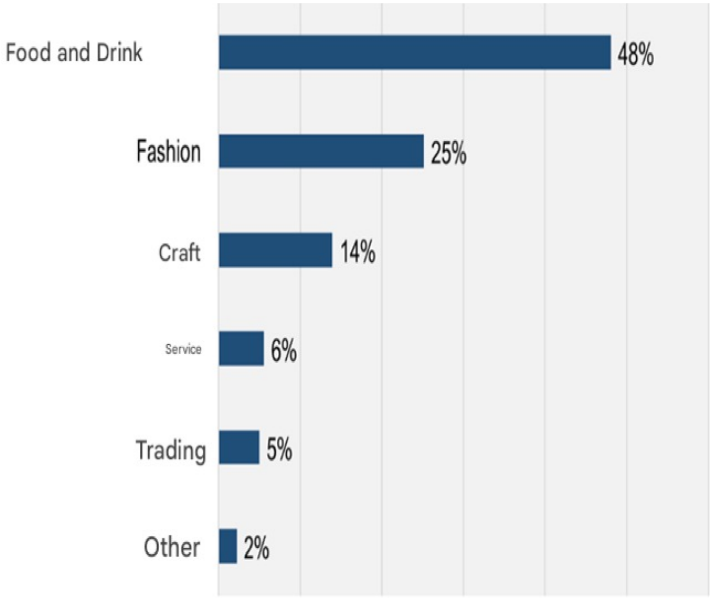

Figure 12. Composition of Business Actors (%)

Several key factors contribute to the strong presence of the F&B sector within Bandung's SME ecosystem:

1. Consistent Consumer Demand: The food and beverage industry benefits from sustained consumer demand, as food is a basic necessity that remains relatively stable despite economic fluctuations. Unlike other sectors that may experience cyclical downturns, the demand for food and beverages continues to thrive even in times of economic uncertainty.
2. High Profit Potential and Scalability: The profitability of the F&B industry is relatively high, with businesses able to generate significant revenue through product differentiation, branding, and innovative marketing strategies. Additionally, scalability is a key advantage, as F&B businesses can expand from small home-based operations to full-scale restaurant chains, catering services, or packaged food brands.
3. Adaptability to Market Trends: The F&B sector is highly dynamic, allowing business owners to quickly adapt to emerging trends and changing consumer preferences. The rise of healthy food trends, specialty diets, fusion cuisines, and innovative beverage concepts has encouraged SMEs to constantly innovate. Moreover, digitalization has further fueled the industry's growth, with online food delivery platforms, social media marketing, and cloud kitchens becoming essential tools for business expansion.
4. Accessibility for New Entrepreneurs: The relatively low barrier to entry makes the F&B industry an attractive choice for first-time entrepreneurs. Unlike industries that require specialized skills, expensive machinery, or large-scale investments, food businesses can start with small capital and simple setups. Many entrepreneurs begin with home-based food production, pop-up stalls, or online food sales before gradually expanding into brick-and-mortar establishments.

The dominance of the F&B sector within Bandung's SME landscape also reflects the city's rich culinary heritage and vibrant food culture. Bandung is widely known as a culinary tourism hub, attracting visitors eager to experience local delicacies and innovative food creations. This further strengthens the industry's appeal, as the demand for unique food products and dining experiences continues to grow.

However, while the F&B sector presents significant opportunities, business owners also face challenges such as intense market competition, fluctuating ingredient prices, supply chain disruptions, and evolving consumer preferences. To remain competitive, SMEs in the F&B sector must focus on product differentiation, quality consistency, digital marketing strategies, and efficient operational management.

By leveraging Bandung's strong culinary identity, embracing digital platforms, and fostering innovation in food production and distribution, the F&B sector can continue to thrive and serve as a major driver of Bandung's SME economy. Furthermore, targeted support from local government initiatives, business incubators, and industry partnerships will be essential in enhancing the resilience and competitiveness of SMEs in this sector.

The data presented in **Figure 13** indicates that SME entrepreneurs in Bandung City are predominantly individuals with a high school and undergraduate education background, each comprising 47% of the total SME owners. This dominance suggests that most business owners in the city have at least a high school

diploma or higher, which may provide advantages in terms of business knowledge, managerial skills, and technical expertise.

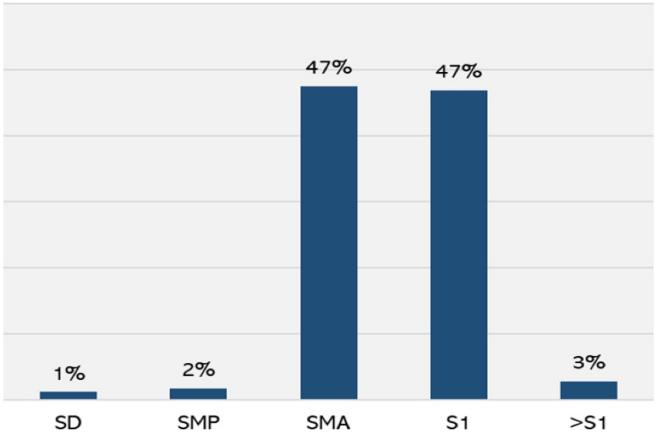

Figure 13. Education Level of Business Actors (%)

A higher level of education among entrepreneurs can enhance their ability to manage businesses more effectively, make strategic decisions, and adapt to market changes. Educated entrepreneurs are also more likely to have better financial literacy, stronger problem-solving abilities, and access to professional networks that can support business growth. Moreover, they tend to be more open to adopting digital technology, utilizing e-commerce platforms, digital payment systems, and online marketing strategies to expand their business reach and increase operational efficiency.

Despite these advantages, entrepreneurial success is not solely determined by formal education. Many successful businesses are built by individuals with strong practical experience, creativity, and resilience, regardless of their educational background. However, the dominance of entrepreneurs with at least a high school education suggests that access to business training programs, mentorship, and digital literacy initiatives is crucial to ensuring that all SME owners, including those with lower educational backgrounds, can compete and thrive in the evolving digital economy.

Moving forward, efforts should be directed toward providing equal access to business development resources, financial support, and capacity-building programs to empower entrepreneurs at all educational levels. By fostering an inclusive and innovative SME ecosystem, Bandung can further strengthen its role as a key player in Indonesia's growing digital economy.

The distribution of monthly turnover among SMEs in Bandung City exhibits substantial variation, highlighting the diverse financial performance of business actors in the region. As shown in **Figure 14**, the turnover levels of SMEs are categorized into five distinct groups: less than IDR 50,000,000; IDR 50,000,001 – IDR 100,000,000; IDR 100,000,001 – IDR 150,000,000; IDR 150,000,001 – IDR 200,000,000; and more than IDR 200,000,000.

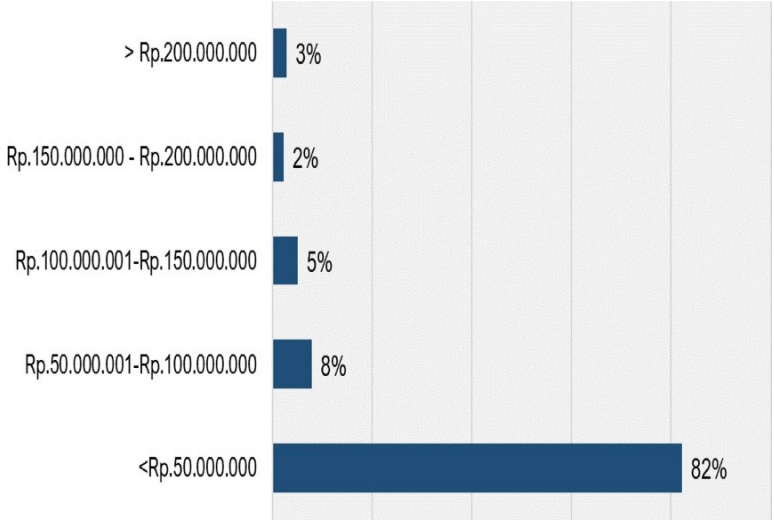

Figure 14. Business Turnover (%)

The data reveals that the vast majority (82%) of SMEs in Bandung City fall into the lowest turnover category, earning less than IDR 50,000,000 per month. This dominance suggests that most small businesses operate on a relatively modest scale, likely catering to local markets with limited capital, operational capacity, and access to advanced business development resources. The prevalence of SMEs in this category may also indicate that many entrepreneurs are still in the early stages of business growth, focusing on sustaining their operations rather than scaling up aggressively.

On the other hand, a smaller percentage of businesses achieve higher monthly turnovers, reflecting differences in market reach, business model effectiveness, and financial investment. Businesses with turnovers exceeding IDR 100,000,000 per month are likely to be more established, benefiting from better supply chain management, digital integration, and competitive differentiation strategies. These SMEs may have stronger customer bases, larger operational capacities, and more sophisticated financial management practices, allowing them to scale and sustain higher revenue levels.

The significant gap between lower and higher-earning SMEs underscores the need for targeted interventions to support business growth and financial resilience. Policies aimed at enhancing financial access, providing digital transformation training, and improving market linkages could help small-scale entrepreneurs transition into higher revenue brackets. Encouraging the adoption of e-commerce, digital marketing, and data-driven decision-making could also play a crucial role in increasing turnover levels among SMEs, fostering a more competitive and inclusive business environment in Bandung City.

The age composition of SMEs in Bandung City exhibits a diverse distribution, reflecting both the emergence of new businesses and the sustainability of long-standing enterprises. As depicted in **Figure 15**, the surveyed SMEs fall into five business age categories: less than 1 year, 1-5 years, 5-10 years, more than 10 years, and those who did not provide information on business age.

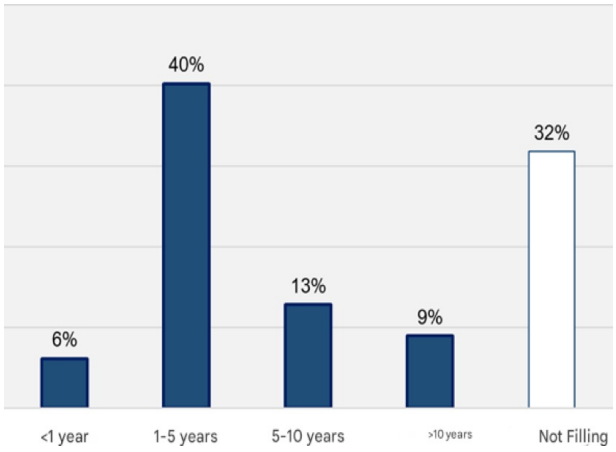

Figure 15. Business Age (%)

A notable finding from the survey is that 40% of SMEs in Bandung City have been operating for 1-5 years, demonstrating significant entrepreneurial activity and business formation in recent years. This trend suggests that various factors are contributing to the establishment of new businesses, including easier access to capital, advancements in digital technology, and supportive government policies aimed at fostering small business growth. Additionally, the rise of e-commerce platforms and digital payment systems has provided new entrepreneurs with opportunities to enter the market with relatively low barriers.

Meanwhile, SMEs that have been operating for more than 10 years indicate the presence of experienced and well-established businesses that have successfully navigated market challenges over time. These longer-standing enterprises contribute to the stability of Bandung's business ecosystem, providing employment opportunities and economic resilience. However, sustaining business longevity requires adaptability, particularly in an era of rapid digital transformation and changing consumer preferences.

The presence of newly established businesses (less than 1 year old) also highlights the dynamic nature of Bandung's SME landscape. Many of these ventures are likely experimenting with innovative business models, leveraging digital platforms, and responding to emerging market trends. The challenge for these new businesses is ensuring sustainability and scaling operations effectively to transition into higher revenue brackets and long-term stability.

Overall, the varied business age composition among SMEs in Bandung City reflects a healthy and evolving

entrepreneurial ecosystem. However, continued support in terms of business mentoring, financial access, and digital literacy programs will be essential in enhancing business resilience, reducing failure rates, and fostering long-term economic growth.

The results of a survey conducted on MSMEs in Bandung City reveal that business activities are concentrated in five main sectors, namely fashion, crafts, food and beverages, trade, and services (**see Figure 16**). Among these categories, the food and beverage sector dominates, accounting for 67.6% of total MSMEs. This overwhelming percentage indicates strong interest and market potential in the culinary business, positioning it as a key driver of Bandung's MSME sector.

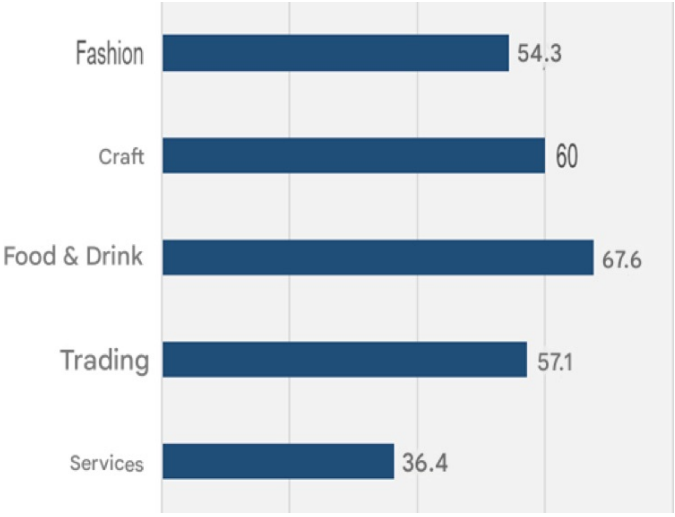

Figure 16. Businesses Located in Centers (%)

Bandung has long been recognized as a Culinary City, renowned for its diverse and innovative food culture. The city's rich culinary heritage and vibrant street food scene make it a magnet for both local and international tourists. This status significantly contributes to the rapid growth of food and beverage businesses, as entrepreneurs continually introduce new flavors, fusion cuisines, and contemporary dining experiences to cater to evolving consumer preferences.

Several factors support the dominance of the food and beverage industry in Bandung. First, the high demand for ready-to-eat food, specialty snacks, and unique beverages has encouraged more entrepreneurs to enter this sector. Second, the rise of digital platforms and online food delivery services has made it easier for food businesses to reach a wider audience with lower operational costs. Additionally, social media and influencer marketing have played a crucial role in boosting brand visibility, enabling MSMEs to thrive even with minimal physical presence.

Beyond its economic significance, the flourishing food and beverage industry also enhances Bandung's tourism appeal. Tourists often visit the city specifically to explore its renowned culinary destinations, ranging from traditional Sundanese cuisine to modern café culture and artisanal street food. This culinary tourism boom further stimulates local economic activity, creating a cycle of growth and innovation within the MSME sector.

Despite its dominance, the food and beverage industry also faces challenges, such as market saturation, fluctuating raw material costs, and the need for continuous innovation to remain competitive. To sustain growth, businesses in this sector must adopt strategies that emphasize quality, branding, digital integration, and customer experience enhancement. Moreover, government support in the form of business training, access to funding, and culinary festivals can further strengthen this sector's role in Bandung's overall economic landscape.

A survey conducted on MSMEs in Bandung City reveals that the majority of business actors market their products within the city, accounting for 28.8% of the total MSMEs (see **Figure 17**). This indicates that Bandung remains the primary market for most small and medium-sized enterprises, benefiting from high local demand, strong consumer purchasing power, and a well-established economic ecosystem.

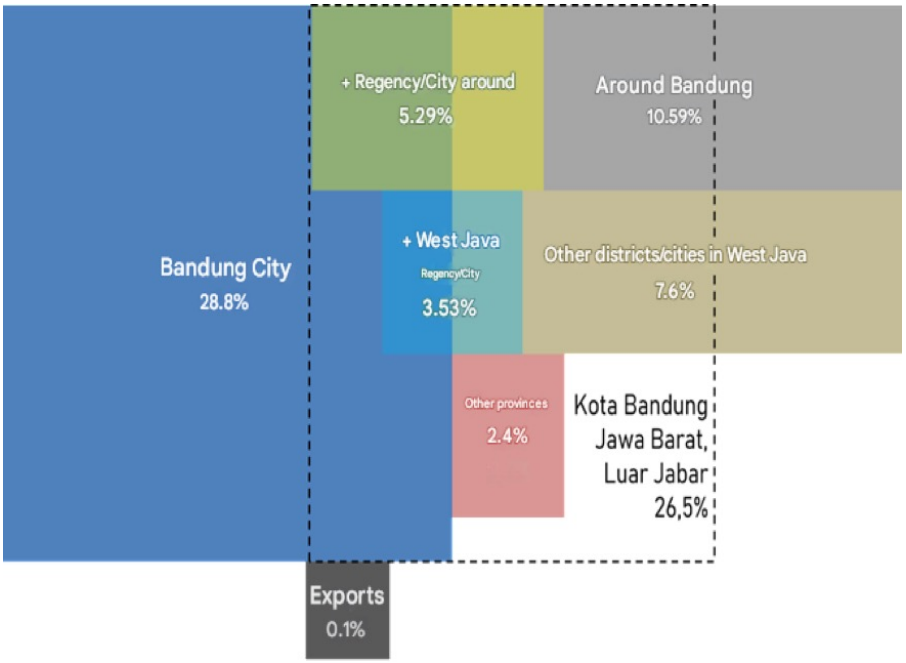

Figure 17. Product Marketing Area (%)

However, the survey also highlights a notable expansion trend, with 26.5% of MSMEs successfully reaching markets beyond Bandung, including other regions in West Java and various provinces across Indonesia. This demonstrates the growing regional influence of Bandung-based MSMEs, supported by improved logistics, digital marketing strategies, and e-commerce platforms. The ability to penetrate wider markets signifies substantial growth potential, allowing businesses to scale operations, increase revenue, and build brand recognition beyond their immediate geographical area.

Several factors contribute to the successful regional expansion of Bandung MSMEs. First, the availability of digital sales channels, such as online marketplaces, social media commerce, and direct-to-consumer platforms, enables businesses to reach a broader audience with minimal physical infrastructure. Second, collaborations with regional distributors and retail networks provide additional access points for MSME products. Third, the unique appeal of Bandung's fashion, craft, and food industries makes these products highly desirable outside the city, further fueling demand.

Despite this positive expansion trend, some MSMEs still face challenges in scaling their businesses beyond local markets. Barriers such as logistics constraints, regulatory compliance, access to financing, and market competition can slow down growth. To further support MSMEs in achieving broader market penetration, policymakers, business associations, and digital platforms must provide capacity-building programs, export facilitation, and financial incentives.

Overall, the marketing expansion of Bandung's MSMEs beyond city borders represents a crucial step toward long-term sustainability and economic resilience. By leveraging digital transformation, strengthening supply chains, and fostering innovation, Bandung's MSMEs have the potential to compete nationally and even enter the global market in the future.

9.3. USE OF DIGITAL TECHNOLOGY

The data presented in **Table 2** highlights the varying levels of digital technology adoption across different business functions among MSMEs in Bandung City. One of the most prominent areas of digital utilization is in marketing, where 47.1% of business actors "always and routinely" use digital applications to promote their products and engage with customers effectively. This high percentage indicates a strong awareness of the importance of digital marketing, which enables businesses to expand their reach, increase brand visibility, and boost sales through online platforms.

Table 2. Level of Digital Application Usage per Business Field (%)

	Marketing	Production	Design	Payment
Rarely	5,9%	17,6%	11,8%	5,9%

Sometimes/not always	23,5%	8,8%	17,6%	20,6%
Always and routinely	47,1%	26,5%	38,2%	47,1%
Often but not necessarily	23,5%	23,5%	17,6%	17,6%
Do not use	0,0%	23,5%	14,7%	8,8%

Conversely, the data also shows that only 5.9% of business actors "rarely" utilize digital applications for marketing purposes, further confirming that the majority of MSMEs in Bandung City recognize the necessity of digitalization in business promotion. The widespread use of social media, e-commerce platforms, and online advertising tools supports business actors in achieving better customer engagement and market expansion.

Beyond marketing, digital technology is also integrated into various other business functions, including production, design, payment, supply chain management, finance, human resources, and networking. However, the level of adoption in these areas varies, depending on the nature of the business, financial capability, digital literacy, and available infrastructure. For instance, digital payment systems are increasingly used due to consumer preference for cashless transactions, while networking and supply chain management tools help businesses optimize operations and build strategic partnerships.

Despite this positive trend in digital adoption, some MSMEs still face challenges in fully integrating digital solutions into their business processes. Factors such as limited access to digital infrastructure, lack of technical expertise, and concerns over cybersecurity may hinder broader adoption. Therefore, continuous support through digital literacy training, financial assistance, and government-backed digitalization programs is essential to maximize the benefits of digital transformation for MSMEs.

Overall, the use of digital technology in marketing and other business functions reflects a growing digital ecosystem among MSMEs in Bandung City. As businesses continue to embrace innovation and digital tools, they can further enhance efficiency, competitiveness, and long-term sustainability in an increasingly digital-driven economy.

In the production sector, the adoption of digital applications among business actors in Bandung City appears to be evenly distributed, reflecting both progress and ongoing challenges in digital transformation. 26.5% of business actors use digital applications “routinely”, integrating technology into their production processes to enhance efficiency and productivity. However, 23.5% use digital applications “often but not regularly”, indicating that some businesses are still in the process of transitioning to digital workflows. Notably, another 23.5% “do not use” digital applications at all, suggesting that barriers such as resource limitations, lack of knowledge, or infrastructure constraints still hinder full digital adoption in this sector.

In the design sector, digital technology plays a crucial role in enhancing creativity and innovation among businesses. The data shows that 38.2% of business actors use digital applications “routinely”, demonstrating a strong integration of design software and creative tools into their business processes. However, 14.7% do not use digital applications at all, possibly due to limited technical skills, high software costs, or a preference for traditional design methods. Additionally, 17.6% of business actors use digital applications “sometimes/not always”, which highlights the need for greater access to digital design tools and specialized training to encourage wider adoption.

The payment sector exhibits one of the highest levels of digital application usage among business actors in Bandung City. 47.1% of business actors routinely use digital applications for transactions, reflecting a strong preference for cashless payments and financial technology (fintech) solutions. This widespread adoption indicates that digital payment systems offer significant benefits, such as efficiency, security, and convenience. However, despite this positive trend, 8.8% of business actors still do not use digital applications for payments. This could be due to resistance to change, lack of familiarity with digital financial tools, or limited access to the necessary infrastructure.

Overall, the varying levels of digital adoption across different business functions highlight both the progress and challenges faced by MSMEs in Bandung City. While digital technology is increasingly utilized in marketing, payments, and design, the production sector still faces obstacles in fully integrating digital solutions. To address these gaps, government initiatives, business support programs, and digital literacy training can play a key role in accelerating the adoption of technology and enhancing the competitiveness of MSMEs in Bandung City.

Meanwhile, the level of digital application usage per business sector (%) in Bandung City, such as supply, finance, HR, networking, and others can be seen in **Table 3**.

Table 3. Level of Digital Application Usage per Business Field (%)

	Supply	Finance	HR	Network	Other
Rarely	11,8%	14,7%	17,6%	17,6%	11,8%
Sometimes/not always	11,8%	5,9%	5,9%	14,7%	5,9%
Always and routinely	14,7%	32,4%	17,6%	44,1%	11,8%
Often but not necessarily	35,3%	11,8%	20,6%	20,6%	11,8%
Do not use	26,5%	35,3%	38,2%	2,9%	58,8%

Source: Survey results.

In the supply sector, the use of digital applications is still relatively low, with only 14.7% of business actors integrating digital technology "routinely" into their supply chain management. This suggests that while some businesses have adopted digital procurement and inventory management systems, the overall adoption rate remains limited. A significant 26.5% of business actors "do not use" digital applications at all, indicating barriers to digital adoption, such as cost concerns, lack of knowledge, or resistance to change. Additionally, 35.3% of business actors use digital applications "often but not necessarily", reflecting the need for more stable, user-friendly, and accessible digital solutions to enhance supply chain efficiency.

In the financial sector, 32.4% of business actors use digital applications "routinely" for managing their business finances, emphasizing the growing importance of digital financial tools, accounting software, and fintech solutions. However, an equal proportion of 35.3% of business actors "do not use" digital applications at all, suggesting that many business owners still rely on manual bookkeeping or lack awareness of available financial management applications. This indicates an opportunity for financial literacy programs and training initiatives to help MSMEs transition toward more efficient and transparent financial management systems.

The human resources (HR) sector shows one of the lowest adoption rates of digital applications, with only 17.6% of business actors using them "routinely". Meanwhile, 38.2% of business actors "do not use" digital applications at all, reflecting low awareness or perceived necessity of digital HR solutions among MSMEs. The limited adoption may stem from a lack of knowledge about digital HR tools, concerns about implementation complexity, or budget constraints. Encouraging businesses to leverage HR management software, digital payroll systems, and employee training platforms could help improve workforce efficiency and business operations.

In the networking sector, 44.1% of business actors use digital applications "routinely", indicating a high awareness of the importance of digital networking and business connections through platforms like LinkedIn, WhatsApp Business, and online business communities. However, 2.9% of business actors "do not use" digital applications for networking at all, suggesting that a small fraction still prefers traditional methods such as direct face-to-face interactions, referrals, or offline business networks.

The "other" category reveals that 58.8% of business actors "do not use" digital applications at all, indicating significant areas where digital technology adoption is still minimal. Only 11.8% use digital applications "routinely", highlighting ample room for improvement and innovation in integrating digital technology into various other aspects of business operations. This suggests an opportunity for exploring new digital solutions tailored to the diverse needs of MSMEs, ensuring broader and more inclusive technological adoption.

Overall, digital adoption among MSMEs in Bandung City varies significantly across different business functions. While marketing, networking, and payments show higher adoption rates, sectors like supply, HR, and finance still face notable gaps in digital utilization. Addressing these gaps requires targeted efforts in digital literacy, financial support for technology adoption, and user-friendly digital solutions to help MSMEs fully leverage digital transformation for business growth and sustainability.

9.4. LEVELS OF BENEFIT OF DIGITAL TECHNOLOGY

The survey results on the level of benefits of digital technology are seen in **Table 4.**

Table 4. Level of Application Benefits Per Business Sector (%)

	Marketing	Production	Design	Payment
Beneficial	17,3%	15,1%	19,0%	20,7%
Quite beneficial	44,7%	29,6%	33,0%	35,2%
Very useful	34,6%	22,9%	31,3%	33,5%
Few benefits	2,2%	10,1%	5,0%	3,9%

	Marketing	Production	Design	Payment
Do not use	0,0%	11,7%	4,5%	0,6%
No answer	1,1%	10,6%	7,3%	6,1%

Source: Survey results.

In the marketing sector, 34.6% of business actors consider digital technology as "very useful", while 44.7% consider it "quite useful". This indicates that the majority of business actors recognize the significant benefits of digital marketing, such as broader customer reach, cost efficiency, and targeted advertising. Notably, only 2.2% consider digital marketing "slightly useful", and none reported not using digital technology, showing that digital marketing has been widely adopted among MSMEs.

In the production sector, the adoption of digital technology is slightly lower, with 22.9% of business actors considering it "very useful" and 29.6% considering it "quite useful". However, 11.7% of business actors do not use digital technology at all in production, indicating that there are still challenges in implementation, such as limited access to technology, lack of technical expertise, or cost constraints. This suggests the need for further support in training and investment incentives to enhance digital adoption in the production process.

In the design sector, 31.3% of business actors consider digital technology "very useful", while 33% consider it "quite useful". Only 5% perceive digital applications as "slightly useful", and 4.5% do not use them at all. This data suggests that digital tools have significantly contributed to the design process, making it more efficient and innovative. However, there is still room for improvement to ensure broader adoption of digital design tools, possibly through affordable software solutions and training programs.

The payment sector shows a high level of digital technology adoption, with 33.5% of business actors considering it "very useful" and 35.2% considering it "somewhat useful". These figures indicate that business actors highly value the efficiency, security, and convenience of digital transactions. Remarkably, only 0.6% of business actors do not use digital technology for payments, highlighting that digital payment systems have become a near-universal standard for MSMEs. This suggests that government and private sector initiatives to promote digital payment adoption have been successful in driving financial technology integration.

The findings highlight that digital technology is widely embraced across various business functions, especially in marketing and payments, where adoption rates are the highest. However, sectors like production and design still face certain barriers to full digital integration. Increasing digital literacy, providing financial support for technology investments, and ensuring accessibility to user-friendly digital tools could help MSMEs further optimize their business operations and enhance competitiveness in the digital economy.

Next is the continued result of the level of benefits of using digital technology which includes the fields of supply, finance, HR, networking and others. The results can be seen in the continuation of **Table 5.**

Table 5. Level of Application Benefits per Business Sector (%)

	Supply	Finance	HR	Network	Other
Beneficial	17,3%	12,1%	19,0%	19,7%	6,7%
Very helpful	24%	26,8%	19,6%	33%	8,4%
Quite beneficial	29,1%	32,4%	24,6%	34,6%	10,0%
Few benefits	8,0%	10,1%	10,0%	3,9%	4,2%
Do not use	8,4%	8,4%	15,6%	2,8%	10,4%
No answer	13,2%	10,2%	11,2%	6,0%	60,3%

In the supply sector, 24% of business actors consider digital technology "very useful", while 29.1% consider it "quite useful". This suggests that a majority of businesses recognize the positive impact of digital technology on supply management, improving efficiency, inventory tracking, and procurement processes. However, 8.4% of business actors do not use digital technology at all in supply management, indicating barriers such as technological limitations, lack of skills, or resistance to change in this sector.

In the financial sector, 26.8% of business actors perceive digital technology as "very useful", and 32.4% consider it "quite useful". This indicates that digital finance tools, such as accounting software and mobile banking, are highly valued for improving efficiency, accuracy, and transparency. Despite these benefits, 8.4% of business actors still do not use digital financial tools, suggesting that some businesses may still rely on traditional manual methods due to habit or perceived complexity of digital solutions.

In the HR sector, 19.6% of business actors find digital technology "very useful", and 24.6% consider it "quite useful". However, 15.6% do not use digital technology for HR management, indicating that digital

adoption in HR remains relatively low. Possible reasons include a lack of awareness about digital HR tools, limited perceived need for automation, or challenges in implementation. This suggests an opportunity for training and support in digital HR management to help businesses streamline workforce management.

In the networking sector, digital technology plays a crucial role, with 33% of business actors considering it "very useful", and 34.6% considering it "quite useful". This data highlights that business actors highly value digital platforms for expanding business networks, partnerships, and collaborations. Notably, only 2.8% of businesses do not use digital networking tools, demonstrating widespread adoption in this sector.

The "other" category shows the lowest level of digital technology adoption, with only 6.7% of business actors considering it "useful" and 8.4% considering it "very useful". Interestingly, 60.3% did not respond, which may indicate a lack of clarity on how digital technology applies to other business functions or limited exposure to relevant digital tools. This suggests that there are still untapped areas for digital transformation, and further research or awareness campaigns may be needed to explore these opportunities.

The survey findings highlight that digital technology is widely adopted in supply chain management, finance, HR, and networking, but adoption levels vary by sector. Networking and finance show the highest levels of adoption, while HR and supply chain still face certain barriers. The "other" category reflects areas that may require further exploration and support to increase digital adoption. These insights underscore the importance of digital literacy programs, better access to technology, and tailored digital solutions to help business actors maximize the benefits of digital transformation.

9.5. NEEDS FOR INTERNET TECHNOLOGY

Based on the survey results presented in **Table 6**, internet technology is considered highly essential in various business sectors, particularly in marketing. 83.2% of business actors stated that the internet is "very necessary" for marketing activities. This highlights the critical role of the internet in modern marketing strategies, enabling a broad and segmented global reach. Businesses benefit from digital platforms that allow creative content creation, direct customer interactions via social media, and real-time campaign performance analysis. Additionally, online transaction capabilities and targeted digital advertising (such as search ads and display ads) further reinforce the internet's role as a primary pillar in market expansion and sales growth.

Table 6. Needs for Internet Technology per Business Sector (%)

	Marketing	Production	Design	Payment
Quite necessary	15,1%	25,7%	17,9%	19,0%
Very necessary	83,2%	55,9%	74,3%	78,2%
No need	0,0%	5,0%	0,0%	0,6%
Don't know	0,0%	5,0%	2,2%	0,0%
No answer	1,7%	8,4%	5,6%	2,2%

In other business sectors, such as production, design, and payment, the necessity of internet technology is also evident, with 50% to 85% of business actors stating that it is "very necessary". This indicates that digital connectivity plays a significant role in enhancing operational efficiency, automation, and innovation across different aspects of business management. The internet enables cloud-based production planning, digital design tools for product development, and seamless online payment systems, all of which contribute to improved productivity and customer satisfaction.

These findings suggest that business actors in Bandung City recognize the internet as a fundamental tool for business sustainability and growth. Therefore, continuous digital transformation efforts, infrastructure improvements, and digital literacy programs are crucial to ensure that all business sectors can fully leverage the potential of internet technology.

According to **Table 7,** 50%–70% of business actors in the supply, finance, HR, and networking sectors consider internet technology "very necessary". This emphasizes the crucial role of digital connectivity in improving efficiency, coordination, and productivity across various business functions.

Table 7. Needs for Internet Technology per Business Sector (%)

	Supply	Finance	HR	Network	Other
Quite necessary	26,8%	24,6%	24,0%	7,8%	
Very necessary	57,5%%	65,4%	53,6%	23,5%	

	Supply	Finance	HR	Network	Other
No need	2,2%%	1,7%	5,6%	2,2%	
Don't know	4,5%	2,2%	5,0%	7,8%	
No answer	8,9%	6,1%	11,7%	58,7%	

1. Supply Chain Management
   The internet enables producers to monitor and manage raw material and finished product inventory with greater accuracy. Digital tools help streamline the production process through automation systems and data-driven decision-making, allowing businesses to respond more quickly to market demand changes. Additionally, better integration between producers, suppliers, and distributors optimizes operational efficiency and reduces logistics costs.
2. Financial Management
   Internet technology plays a crucial role in simplifying financial transactions, improving bookkeeping accuracy, and enabling real-time tracking of cash flow. Digital banking, online invoicing, and fintech solutions help businesses manage their finances more efficiently and securely, reducing the risk of errors and fraud.
3. Human Resource (HR) Management
   The adoption of digital technology in HR enhances employee management, facilitates remote work, and improves training programs. Cloud-based HR systems allow businesses to track employee performance, automate payroll processes, and streamline recruitment efforts, making HR operations more effective and data-driven.
4. Networking and Business Expansion
   The internet strengthens business actors' capacity to connect with partners, investors, and customers, both locally and globally. Through digital networking platforms, social media, and professional forums, businesses can expand their reach, foster collaborations, and gain valuable market insights.

By leveraging internet technology, business actors in Bandung City can optimize operations, increase productivity, and strengthen their competitive edge. To maximize these benefits, ongoing digital transformation efforts and capacity-building programs are essential to ensure that all business sectors can fully utilize the potential of internet-based solutions.

9.6. DIGITAL TECHNOLOGY ADOPTION PLAN

Based on the survey results presented in **Table 8 and Table 9,** the majority of business actors across various sectors in Bandung City plan to allocate a significant amount of funds for the implementation of digital technology. More than 80% of business actors stated that they would allocate funds at a high to very high level. This indicates that digital technology has become an essential need in carrying out business activities across different sectors.

Table 8. Fund Allocation Plan for Technology by Business Sector

	Marketing	Production	Design	Payment
Low	26,5%	20,6%	38,2%	23,5%
Very low	2,9%	8,8%	5,9%	5,9%
Very high	32,4%	32,4%	14,7%	23,5%
Tall	38,2%	38,2%	41,2%	47,1%

Table 9. Fund Allocation Plan for Technology by Business Sector

	Supply	Finance	HR	Network	Other
Quite necessary	20,6%	14,7%	11,8%	17,6%	11,8%
Very necessary	17,6%	14,7%	17,6%	5,9%	29,4%
No need	23,5%	35,3%	26,5%	32,4%	23,5%
Don't know	38,2%	35,3%	44,1%	44,1%	35,3%

Source: Survey results.

The high commitment to investment in digital technology is influenced by several factors. First, the increasing market competition drives business actors to adopt technology to enhance competitiveness and

operational efficiency. Second, the use of digital technology enables more efficient management of production, finance, and human resources, helping to reduce operational costs and increase productivity. Additionally, the growing consumer awareness of digital-based services is a major reason for businesses to adapt to digital marketing strategies, e-commerce, and online payment systems.

With significant funding allocated for digitalization, it is predicted that in the future, many business actors in Bandung City will begin implementing advanced technologies such as artificial intelligence (AI)-based business analytics, cloud computing, and automation in various operational aspects. Moreover, the need for training and digital skill development among business actors and workers will continue to rise to ensure optimal utilization of digital technology.

Thus, this high investment plan in digital technology indicates that the business ecosystem in Bandung City is moving towards a more extensive digital transformation. To maximize the impact of this investment, support from various parties—including the government, industry stakeholders, and digital service providers—is necessary in the form of training, infrastructure development, and digital solutions tailored to business needs.

10. CONCLUSION

The implementation of the digital economy in Bandung City has shown a significant impact in strengthening strategic sectors, in line with global trends in digital transformation. Digitalization has increased efficiency in various business sectors, including marketing, production, design, finance, and business networks. The results of the study show that the majority of business actors in Bandung have adopted digital technology in their operations, with a high level of need for internet technology. In addition, the majority of business actors also plan to allocate funds for the development of digital technology, which shows a strong commitment to digital transformation. However, there are still challenges in adopting technology in several sectors, especially in terms of resources, skills, and access to digital infrastructure.

11. STATE OF THE ART

The digital economy has become a major pillar in global economic growth, with many cities in the world having adopted digital technology to improve their competitiveness. This study highlights how Bandung City, as a creative city, has utilized digital technology to accelerate economic growth and improve business efficiency. The approach used in thixs study adapts the framework from the IMF, ADB, and G20 to adapt digitalization operations to local needs. This study contributes to the literature on the digital economy by highlighting the challenges and opportunities faced in the adoption of digital technology by business actors in developing cities. Thus, this study not only provides a comprehensive picture of the potential of the digital economy in Bandung, but can also be a reference for other cities that want to implement similar strategies in facing digital transformation.

AUTHOR CONTRIBUTIONS

Kurniadi Kurniadi: Conceptualization, methodology, formal analysis, investigation, data curation, writing – original draft, writing – review & editing, project administration, funding acquisition. **Rosyidah Rahmah**: Conceptualization, methodology, formal analysis, visualization. **Desi Indrawati**: Review & editing, visualization, , writing – review & editing, data curation. **Annisa Rachma Khamilla**: project administration, visualization, investigation. **Alya Nufus Shafira**: Project administration, visualization, investigation. **Harris Purmama**: Validation, original draft, investigation, data curation. **Rivai Ahmad**: Original draft, visualization, investigation, data curation. **B Badruzzaman**: Resources, writing – review & editing, supervision. **M.M. Bagal**: Conceptualization, methodology, formal analysis.

COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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DATA AVAILABILITY STATEMENT

The dataset, published on Zenodo, is available in full at the following link: https://zenodo.org/records/16757269

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