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# **DIGITAL TRANSFORMATION IN AVIATION, TOURISM AND HOSPITALITY IN SOUTHEAST ASIA**

Edited by  
Azizul Hassan and Nor Aida Abdul Rahman



# Digital Transformation in Aviation, Tourism and Hospitality in Southeast Asia

Technological advances and the drive to digitalize business processes in aviation, tourism, and hospitality have forced the industries to go along with the digital movement. The results are often mixed. This book brings together contributions from leading scholars in the field and explores the digital transformation in these industries in Southeast Asia.

The book looks at the impact of digital transformation on the region and the issues and challenges brought about by this transformation. It also addresses trends in the industries from blockchain technology, AI, biometric and mobile technology applications to in-flight catering. It examines the impact of COVID-19 on the industries and how the pandemic has led to businesses adopting new business models. Through the case studies of digital adoptions in the region, readers will gain insights on how the countries have leveraged new technologies and the implementation processes to drive digital transformation.

The book aims to help scholars and policy makers understand the digital advances in the industries to better formulate responses in research and policy making and deliver effective digital transformation.

**Azizul Hassan** is a member of the Tourism Consultants Network of the UK Tourism Society. He has been working for the tourism industry as a consultant, academic, and researcher for over 20 years.

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# Digital Transformation in Aviation, Tourism and Hospitality in Southeast Asia

Edited by *Azizul Hassan* and  
*Nor Aida Abdul Rahman*

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# Introduction

*Azizul Hassan and Nor Aida Abdul Rahman*

Aviation, tourism, and hospitality in Southeast Asian countries arguably have been experiencing digital transformation over the years. In this particular region of the world, digital transformation aims to satisfy the changing aviation, tourism, and hospitality business and market requirements. It also entails employing the most recent technologies for either adapting the current or developing new culture, processes of business, and consumer experiences. Technological innovations in this region are widely applied in both the consumer and business markets of aviation, tourism, and hospitality as one of the key factors to benefit these industries, and to improve both the tourists' and travellers' experiences.

Literally, technology stays by the tourists' and travellers' side during the entire purchase journey. One of the most important technologies in aviation, tourism, and hospitality is mobile technology. The cell phone has become the tourists' and travellers' tour guide, communicates with travel agencies, books airline tickets, finds the best restaurants, acts as a map, and so on. The Internet of things (IoT) plays a significant role in aviation, tourism, and hospitality. On the other hand, IoT brings significant updates to these industries with the support of integrated sensors connected to the Internet inside items like cars, suitcases, buildings, and more.

The technological characteristics of aviation, for example, show that the adoption of the emerging technologies helps ensure the safety of travellers. Globally, aviation is recognized as a highly regulated industry that helps the economic growth of any country. Aviation supports many other industries such as tourism, manufacturing, business, etc. Also, technology plays a significant role in aviation as most travellers use aircraft to travel from one location to another.

In tourism, technological innovations, tourism technology, or tourism automation benefit both the tourists and the travellers. Technological innovations, such as flight monitoring, online travel and tourism firms, and systems, allow tourists and travellers to rate their experiences. These also offer significant benefits allowing tourist to enjoy their travel and stay connected with the family. As far as technology advances in tourism are concerned, smartphones, smart speakers, and artificial intelligence (AI) assistants are all supporting tourists and travellers. Voice search is increasingly being used by tourists and travellers to check and get airline tickets, hotel rooms, and travel experiences.

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Hospitality is competitive and essentially needs to keep up with the very latest technological trends. Technology can help hospitality to streamline processes and to improve the level of customer experience. Technology supports hospitality, especially with regard to the widespread adoption of voice search, virtual reality (VR), augmented reality (AR), AI, the IoT, fingerprint recognition, and so on. Contactless payment for instance has become more popular in hospitality settings, while mobile check-ins have emerged in hotels, restaurants, and airports. Many of these technologies have grown because they help to reduce friction, and cut waiting times for hospitality customers.

Aviation, tourism, and hospitality still require more research studies to analyse the trend of digital transformation. Thus, the call to study digital transformation in aviation, tourism, and hospitality is a timely demand as these are among the fastest growing industries in Southeast Asia contributing to socio-economic development. On this note, this book focuses on the features, breadth, and diversity of digital transformation in aviation, tourism, and hospitality in Southeast Asia.

Hamid and Tan present the context of digital transformation in Southeast Asian aviation, tourism, and hospitality in the first chapter. In the recent era, digital transformation has not only enhanced, but also revolutionized or disrupted every company function. These innovations, which are now being used in aviation, tourism, and hospitality, will change the way customers, industries, and businesses operate. Southeast Asia is rapidly growing in the areas of aviation, tourism, and hospitality, all of which are important economic drivers. In this chapter, we look at how digital revolution is affecting aviation, tourism, and hospitality in Southeast Asia. A thorough examination of Internet marketing, computer systems, mobile communication, technology trends, AI technology, AR technology, VR technology, the IoT, voice recognition technology, and many other topics is conducted.

Nee and Dean, in Chapter 2, discuss the Association of Southeast Asian Nations (ASEAN) region's digital transformation influences, issues, and challenges in aviation, tourism, and hospitality.

Ahmad and Samsudin look at the theoretical and practical aspects of blockchain technology in aviation, tourism, and hospitality in the third chapter. The chapter covers blockchain's essential underlying technology and discusses how it might be used in the tourist industry, which encompasses the aviation and hospitality industries. The most significant obstacles to blockchain adoption are also explored.

Harun, Mokhtar, Singh, and Rahman highlight how artificial intelligence, biometric technology, and mobile technology application in aviation and tourism are changing the face of tourism and air travel in the fourth chapter. In this chapter, the researchers will explain how the current developments in three technologies, namely AI, biometrics, and mobile technology, have revolutionized the landscape of the global air travel and tourist business.

In the fifth chapter, Ghafar discusses present and prospective big data analytics advances in the Southeast Asian aviation, tourist, and hospitality industries. This chapter also seeks to give a detailed explanation of big data analytics, with an emphasis on the technology's recent developments and important problems.

In the sixth chapter, Yusriza and Rahman examine the relationship between technology and in-flight food in air travel, tourism, and hospitality. The primary goal of this chapter is to analyse the role of technology in the airline catering industry and to explain how technology applications in the airline catering industry are related to air travel, tourism, and hospitality. Second, this chapter discusses present and prospective technology applications in airline catering, and third, this chapter examines case studies of many airline caterers who use technology. This chapter concludes with a discussion of existing research and opportunities for future research.

Kadir and Hussin study cross-country instances of technology use in the Asian tourist and aviation industries in the seventh chapter. The purpose of this research is to examine the technology applications of tourism and aviation industry growth in Malaysia and Thailand, two of the most populous ASEAN countries. The link between smartphone technology and the tourist and aviation sectors in Malaysia and Thailand is also examined in this study. TripAdvisor, PlateCulture, Offpeak, chatter bus, and KL Transit are just a few of the smartphone apps that may help tourists organize their travels better. The study also investigates the Internet's role as a source of information in the tourist and aviation industries.

In the eighth chapter, Sharin, Sentosa, and Perumal investigate whether Malaysia's resilient model for rural tourism sustainability is either chaotic or orderly. The tourist industry has been hit the hardest by the crisis. As a result, this research highlights the role of rural tourist activities in rural regions' economic growth in Malaysia before and during the COVID-19 pandemic, as well as providing an analysis of rural tourism locations. As a consequence, an integrated empirical model for rural tourist sustainability (RTS) was suggested, with community resource tourism (CRT) as a causative component and technical development processes (TDP) as a mediator.

Wan-Chik and Hasbullah look at the current and future advancements of big data analytics in Malaysia's aviation, tourism, and hospitality industries in the ninth chapter. This chapter provides an overview of big data and data analytics in the aviation, tourism, and hospitality industries, as well as their present and future developments. In the aviation, tourism, and hospitality industries, a study of previous and present advancements in the usage of big data and data analytics was conducted. The adoption of data analytics by various stakeholders in certain sectors, such as authorities, decision makers, domain researchers, application users, and typical consumers, is discussed in this chapter.

Yasa and Sentosa present an empirical study on the technology usage dimensions within the tourism craft business in Bali, Indonesia, using a structural equation modelling technique in the tenth chapter. Using a quantitative technique, the current study created a connection between technology usage and company growth in the dynamic movement of the tourism craft sector. To determine the three aspects of technology usage that were postulated, a second order confirmatory factor analysis (CFA) was used.

Wahyuningsih, Sentosa, and Hizam examine technological policy guidance on rural tourism sustainability in Indonesia in the 11th chapter. This research

proposes technological policy recommendations for the long-term viability of rural tourism in Indonesia.

Omar, Demong, and Maon wrote the 12th chapter, which analyses the tourist industry during the COVID-19 pandemic and proposes the Tourism Industry Technology Framework (TITEF). This research recommended the TITEF as a way to improve the tourism industry during the COVID-19 pandemic.

Mayor-Vitoria discusses the necessity of contactless hospitality technology in the post-COVID-19 age in the 13th chapter, based on the preceding discussion. This technological acceleration is already laying down a trail and establishing trends that we cannot ignore in the post-COVID-19 age. This chapter also examines a number of factors that are required for the long-term viability of tourist firms and must be considered while rethinking tourism plans.

Again, Mayor-Vitoria focuses on virtual tourism and rebuilding tourist business in the post-COVID-19 period in the 14th chapter. The current situation, which has arisen as a result of the COVID-19 health crisis, is fraught with uncertainty and offers a slew of issues for society in general and tourism in particular. This situation has resulted in the temporary absence of some of the classic tourism-related sustainability issues in select tourist destinations, which the scientific community has viewed as a once-in-a-lifetime chance to rethink tourism and develop a new model based on sustainability. This chapter will look at how an unprecedented worldwide crisis is affecting the tourist industry and how it is being addressed.

Ali, Rahman, and Hassan discuss the history, and present and future trends in technology as well as the safety of aviation and tourism in the 15th chapter. The goal of this study is to close the gap by elucidating the correlational link between safety and technology in aviation and tourism. This chapter expands on the topic of safety in aviation and tourism by emphasizing the significance of maintaining traveller safety throughout their tourist activity or trip from one place to another. This study focuses on the role of technology in ensuring the safety of travellers during air travel and tourist activities.

In Chapter 16, Rahman, Hassan, Sudharmin, Majid, and Nur discuss the future of technological research in aviation, tourism, and hospitality events. First, this chapter will discuss the importance of technology in the aviation industry and the tourism sector, with a focus on tourism event activities; second, it will highlight future technology applications for tourism events; and third, it will explore future research areas in the area of technology and tourism events.

In the 17th chapter, Rahman and Hassan discuss the development and future research priorities for digital transformation in the Southeast Asian countries' aviation, tourism, and hospitality industries. This chapter also discusses the necessity of digital transformation in the aviation, tourist, and hospitality industries in responding to technological, managerial, and marketing challenges.

This book delves deeply into Southeast Asia's digital revolutions in tourism, hospitality, and aviation. This book is deepened with in-depth knowledge about digital transformation technologies in tourism, hospitality, and aviation, as well as a solid understanding of related concepts. This book introduces ideas and dialogues that readers will find extremely beneficial.

# 10 An Empirical Study on the Technology Usage Dimensions within the Tourism Craft Industry in Bali, Indonesia

## A Structural Equation Modelling Approach

*Putu Ngurah Suyatna Yasa and Ilham Sentosa*

### Introduction

The importance of the role of small and medium enterprises (SMEs) as a supporter of Bali tourism has been recognized by the governor of Bali through the regional development vision for 2019–2024. It is closely related to the empowerment of Balinese local wisdom, known as “Nangun Sat Kertih Loka Bali Through the Development of the Planned Universe.” It is also related to the development of SMEs in Bali. The vision is then also stated in the Mission as: Mission 1: Ensuring the fulfilment of food, clothing, and shelter needs in sufficient quantity and quality for the life of the Balinese. Mission 2: Realizing food self-sufficiency, increasing the added value and competitiveness of agriculture, and improving farmers’ welfare. Mission 6: Developing highly competitive human resources, namely quality and integrity, professionalism, and morality that are developed based on the values of the local wisdom of the Balinese. Mission 8: Producing a competent, productive, qualified, and highly competitive workforce and expanding access to job opportunities at home and abroad. Mission 13: Developing new tourism destinations and products based on culture and in favour of the people that are integrated among regions/cities throughout Bali. Mission 16: Building and developing new economic centres in accordance with the potential of districts/cities in Bali by empowering local resources to support economic growth in a broad sense. And Mission 17: Building and developing small and medium-sized industries based on culture (Bali branding) to strengthen the economy of the Balinese.

The substance of the vision and Mission is to empower the Balinese people’s economy by treating SMEs as an important supporting sector in increasing economic growth. The importance of the role of SMEs can be seen in Bali’s gross domestic product (GDP), where the processing industry, with 16 types of business fields including SMEs, contributed to Bali’s GDP on average about 6% per year during the period 2014–2018 (Central Bureau of Statistics, 2019) or occupied the position of the 6th largest contributor of all business fields.

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Likewise, manufacturing/processing industries, including SMEs, occupy the second highest position in the province of Bali after wholesale and retail trade.

The number of SMEs in Bali as of August 2018 increased by 17% from 2016 with added value growth in 2017 of 17% (Director General of Indonesian Small and Medium Industries, 2018). The growth in the number of SMEs in Bali is inseparable from the increasing number of tourist visits, both foreign and domestic tourists. In addition, it also shows the increasing interest in entrepreneurship among the younger generation which currently ranks no. 2 in Indonesia after Yogyakarta. SMEs also have a strategic role in absorbing workers in Bali Province, and are in first position compared to 17 other business fields (Central Bureau of Statistics, 2016).

One part of the growing SMEs in Bali is the small handicraft industry (SHI); its role in the Balinese economy is as one of the key export commodity sectors in addition to livestock, textiles, garments, and paper. The SHI in this study included non-machine weaving, batik, lace, Balinese dance clothing, manuscripts, wood sculpture carvings, iron crafts, bamboo crafts, gold/silver crafts, painting, pandanus weaving, painted egg crafts, and barong crafts. SHI's contribution to Bali's gross regional domestic product (GRDP) increased from 1.82% in 2006 to 1.88% in 2009. Likewise, the value of handicraft exports to Bali's total exports is the second largest after apparel, at 13.94% (Central Bureau of Statistics, 2010).

A report by Bank Indonesia (2010) shows that SHI in Bali has difficulty in increasing its product and business scale. Theoretically, efforts to increase business productivity are closely related to the use of a combination of production factors used in the production process. In traditional neoclassical growth theory, growth is always related to the use of the three factors of production, namely capital, labour, and technology. The theory was further refined by Romer (1986) in the New Growth Theory or the so-called endogenous growth model which is the basis of this research theory. This view develops among developing countries, giving rise to the view that technology is an endogenous factor that can be influenced by various policy variables. The source of growth in this theory is the increasing stock of knowledge and new ideas in the economy which encourages the growth of creativity and initiative in innovative and productive activities that demand increased quality of human resources. The transformation of knowledge and new ideas can occur through international trade, investment, licensing, consulting, and communication activities (Romer, 1986).

Technology increases efficiency in production, namely an increase in output produced while using fewer inputs, or an increase in output with fixed inputs. In general, the higher the technology content, the greater the investment required in the production process. The utilization of technology can be neutral, namely increasing output without having to add input factors, or a bias towards the use of production factors, so that technological progress does not always increase the use of labour (labour saving) or save the use of capital (Simangunsong et al., 2019).

In SHI, the types of technology used include traditional technology, modern technology, and/or a combination of the two, called mixed technology.

Traditional technology includes all types of work tools that are driven by hand without using mechanical power, electricity, computers, or batteries, such as carving tools (chisels and chisels), non-machine wood cutting tools (saws), and traditional wood smoothing tools (shavings), pattern-making equipment, and paint equipment. Modern technology is any type of equipment that is driven by engine power, electricity, computers, or batteries (Nala, 1989). Modern technology is widely used in the production process, for communication (telephone, facsimile, and internet), and transportation. The type of work technology used today is generally a mixture of traditional and modern technology, because not all types of production activities can be carried out using modern technology, especially activities related to artistic values. Likewise, modern technology plays a very important role in increasing productivity, especially for export-based activities or relatively large-scale businesses.

The importance of the role of technology in increasing business growth can be proven from the results of research: Kuznets in 1966 in the United States (Amir, 2008) showed that the contribution of technological progress to economic growth in 1929–1957 was 78%, and in the period 1950–1962 it was 56%. The Solow study (Baier et al., 2006) said that the growth of the American economy between 1900 and 1949, by 80%, was triggered by the role of technology which was included in the total factor productivity. Levy's study, as in Husni (1994), shows that industrial growth in Iraq between 1961 and 1967 was labour saving due to advances in production technology. Restuccia's study shows that the use of modern technology in SMEs can reduce production barriers compared to traditional technology (Restuccia, 2004). The results of the 1972 Field study in South Korea in 1961–1980 (Husni, 1994) showed that industrial growth tends to be capital-intensive triggered by the use of technology.

Amir (2008) mentioned that in five developed countries, namely France, Japan, West Germany, England, and the United States of America, technology contributed to economic growth by 49–76%. According to a Japanese study on the steel industry, technological change will decrease company productivity for the first two years, but after that, it will grow significantly more than the 4.10 percent reduction that occurred at the start of the shift in technology usage (Nakamura, 1981). Previous research in the 1960s showed the role of technological change in increasing the GDP by 0.32% in the Japanese economy (Nakamura, 1981). Again, Nakamura (1981) shows that companies that are less productive generally lack support for the use of technology in production. Subsequent studies show that increased business productivity can be realized through increased technology investment (Thatcher and Oliver, 2001).

Kerr and Newell (2003) show that technological changes must be made for companies that want to exist and still be able to compete. Indonesia's economic growth in the five years from 2000 to 2004 was triggered by capital and modern technology (Wijono, 2005). Likewise, the results of Prabawa and Budhi's research (2017) on the screen printing industry in the city of Denpasar found that capital, wage levels, technology, and employment had a positive and significant effect on productivity. Furthermore, the study of Duan, Mullins, Hamblin, Stanek, Sroka,

Machado, and Araujo (2002) shows that the use of IT in various organizations is able to reduce transaction costs and overcome distance barriers in coordination, which in turn supports the potential for coordination in SMEs at every stage of the business process. The use of IT in organizations including SMEs has the potential to reduce costs and increase business productivity. Ladokun and Osunwole (2013) also stated that information technology (IT) used in communication and collaboration management, customer access, managerial policy making, data management, and knowledge management increases organizational productivity and services.

On the other hand, the studies show that technology does not always have a positive and significant influence on business growth. The results of a study in Indonesia using data from 1969 to 1993 show that technology's contribution is only 4.01% against average annual economic growth of 7.11% (Amir, 2008). The study of Bosworth et al. in Indonesia in 1995 using data from 1964 to 1980 (Amir, 2008) shows that the contribution of technology to supporting output growth is 19.45%. Amir (2008) shows that technology was not the main variable in increasing business growth, but human resources are more important than technology; technology cannot work without human resources managing the technology, because humans have a role in regulating technological production factors. There are conflicting results from these research results, so to ensure the role of technology in business growth in Bali, it is necessary to conduct research on the role of technology in SHI as a tourism supporter.

SMEs in Indonesia make up 99% of all business activities, providing 89% of private sector employment and absorbing 65% of the total workforce in the industrial sector and contributing 60% of GDP (Asia Pacific Foundation of Canada, 2018). However, behind the relatively large contribution, especially in the absorption of labour, SMEs in general have relatively low productivity. Overall, the value added ratio per worker for small businesses is only about 1/200 times the value added per worker for large businesses; this low productivity is a major obstacle in the development of SME businesses in Indonesia. The productivity of SMEs which is still low turns out to be positively correlated with the productivity of Indonesian workers in general, which is nationally ranked number five out of ten Association of Southeast Asian Nations (ASEAN) countries (ASIAN Productivity Organization, 2019). In addition, low productivity is also influenced by the factor of technology utilization which is also relatively low, both for production technology and information technology.

The productivity of SMEs in Bali is not different from conditions at the national level; SMEs in Bali generally have low productivity compared to large industries. In the last five years the Bali Regional Government has tried to encourage the performance of SMEs; in the second quarter of 2017 SMEs in Bali experienced growth of 3.87%, higher than the national figure of 1.32% (Central Bureau of Statistics, 2018). However, this growth was much smaller than the growth of the SMEs, which was 8.95%. Based on this description, it is very important to do research on the impact of using technology on the growth of SHI in Bali.

## Literature Review

### *Defining Economic Growth*

Economic growth is a benchmark which is commonly used to determine the economic performance of a country, describing the increase in total output, known as GDP, in the long term. In traditional neoclassical growth theory as the basis for the theory of endogenous growth from Romer (Todaro and Smith, 2006), that output growth always comes from one or more of the three production factors, namely capital production factors through increased savings and investment, labour through increasing the quantity and quality of manpower, and improving technology.

Neoclassical theory views the role of technology as important because it is able to increase production efficiency through three basic classifications, namely: (1) neutral technological progress (i.e., a higher level of output is obtained with the same quantity of input combinations); (2) labour-saving technological progress, namely technological progress that can save the use of labour production factors; (3) capital-saving technological progress that occurs in many developing countries. The use of more advanced technology can increase labour productivity.

Technological advances can cause an increase in the marginal productivity of labour (MPL) and decrease the marginal productivity of capital (MPK), so as to save the use of capital production factors/capital saving, or reduce MPL and increase MPK so as to save labour (Allen, 1967). This condition will occur with the assumption that factor prices remain relatively unchanged (Layard and Walters, 1978). Meanwhile, production activities that do not experience change/that are neutral will occur if the production process does not cause the rise or fall of MPL and MPK.

The theory of endogenous growth pioneered by Romer (1986) is the beginning of a revival and understanding of the factors that determine economic growth in the long run. Along with the development of the world marked by the development of modern technology in various production activities, the problems of economic growth such as decreasing returns to capital, perfect competition, cannot be explained properly by neoclassical theory. Endogenous growth theory has three principal elements, namely: (1) endogenous technological changes through the process of knowledge accumulation, (2) the creation of new ideas by companies as a result of the spillover mechanism and learning by doing, and (3) the production of consumer goods is supported by knowledge that grows without limits. Endogenous growth theory explains that growth in the long term is determined from within the model by several growth variables that were previously considered exogenous (Romer, 1986; Barro and Sala-i-Martin, 1999).

Furthermore, Romer's (1986) theory emerged as a critique of neoclassical growth theory regarding the decline in the marginal productivity of capital and the convergence of income. However, based on empirical studies, it shows that there is no convergence of income in various countries (Romer, 1986). This is because developed countries have developed technologies that can increase their production capacity. Technological progress is supported by the availability of

quality human resources, so that they can carry out technological innovations that provide significant benefits in development. On the other hand, although developing countries are able to increase physical capital accumulation, they have not been able to catch up with developed countries. In this case, the theory of endogenous growth explains why capital accumulation does not have diminishing returns, but instead is increasing returns with specialization and investment in human resources (Meier and Rauch, 2000).

### *Indicator of Economic Growth*

Economic growth is the concept of measuring changes in output that increase in the long term; growth is directly related to the increase in the production of goods and services measured by the increase in production output which ultimately increases national income through GDP. Economic growth can be measured by several indicators including (1) income growth (gross domestic product) (Suparmoko, 1990). According to Syahputra (2017), production capacity will increase if additional investment has an effect through aggregate demand and supply.

Growth will create prosperity through increased consumption due to higher income increases, therefore in measuring growth indicators of growth in production, income and operating profit are also used for the business sector. People's ability to consume is very dependent on their income; therefore income is a determinant of consumption (Mankiw, 2007), and competitive firms will maximize operating profits until the marginal product of labour equals real wages. (2) The growth of operating profit is based on the concept of Maupa (2004), that aggressive and innovative business owners will try to maximize profits and increase production to ensure long-term business continuity, meaning profit growth and production growth are important benchmarks in determining business growth.

The availability of financial resources, including those obtained from business profits, is a barometer of business growth. Another study says that the company will be able to survive in the long term if it is supported by good profit growth; profit growth will be achieved if revenue growth is higher than cost growth through production growth; then revenue growth and profit growth are indicators of business growth (Foreman-Peck et al., 2006). This study uses indicators of operating profit growth and revenue growth as a proxy for SHI growth.

### *Technology Usage*

Technology etymologically comes from the Greek word "techne" which means the activity and expertise of carpentry by hand (Heidegger, 1977). Technique is a way of revealing or the way in which things are helped to appear. To express, what is the essence of technology? The response is crucial. The distinction between current technology and ancient/traditional technology is that modern technology does not entail anything in the poetic sense of a result beyond itself,

such as production. While old technology contains creative qualities, such as the ability to create poetry. The challenge/challenge-forward disclosure is the most common in current technologies (Heidegger, 1977).

This way of disclosure requires nature to donate its energy excessively so that humans can store and use it. An example is a windmill which is a traditional technology that does not challenge the wind; windmills only rotate when there is a gust of wind, so the rotation is very dependent on the wind, so windmills only reveal wind energy but do not control energy for future use. While mining is challenging to the earth, the earth is exposed as a supply in the form of mines that produce energy (Lim, 2008).

All types of technology are embedded in culture because technology is created by humans (Ihde, 1979). Technology is a certain way of looking at the world (Heidegger, 1977). Technology was created as a mediator between humans and nature; technology can also be considered as a way of thinking that manipulates and exploits the world as a supply. The use of technology is also strongly influenced by the culture of the people; the same technology will be used in different ways depending on the culture of the people who use it (Lim, 2008). For example, gunpowder was first discovered in China and used as entertainment in fireworks events, but in western countries gunpowder is used as a weapon to conquer other countries. Because the technology created also contains elements of the culture of its creator, the transfer of technology from one country to another is directly followed by the transfer of culture and values belonging to the country of origin, because the receiving country technology has not been able to create new technology. So slowly but surely the transfer of technology will also be accompanied by changes in culture and values. So the technology is not free from value, but tends to direct value (Ihde, 1979). Humans are born with various physical limitations, so with the help of technology human abilities can be increased, such as the possibility to move quickly with modern means of transportation, or hear at a distance. This means that humans can transcend physical limitations through their imagination and creativity with the creation of technology.

The use of more advanced technology has implications for business efficiency, which can increase output with a constant amount of input use or decrease the use of inputs to produce a fixed output. In production activities, companies with business strategies based on technological capabilities will be able to compete in a competitive business world, as well as increasing the added value of production through increasing business scale by increasing the use of technology. Improving technological capabilities is related to increasing the contribution of the components that make it up, which includes the physical components of the equipment used, human skills, information technology, and the role of the organization. The contribution of each technology component in each activity forms the total technology contribution which is the level of technology. This level of technology payload is an indication of the strengths and weaknesses associated with technology and the dynamics of transformation. The four components must support each other, so that they are able to transform resources

into production outputs that have higher added value more efficiently, which will indirectly improve business performance.

the results of Kuznet's research in 1966 (Amir, 2008) in the United States show that the contribution of technological progress to the economic growth of the United States in the 1929–1957 period was 78% and in the 1950–1962 period it was 56%. Amir (2008) shows the same trend, that the contribution of technological progress to economic growth in several developed countries is also not much different from the results of the Kuznet's study, around 49 to 76%. However, traditional technology, which is widely used in the SHI production process, does not have to be completely replaced with modern technology, because not all types of work can be done with modern technology. Technology is not only about intelligence and skills in using tools, but has expanded and includes all methods that are achieved rationally and have absolute efficiency for a certain stage of development in every field of human activity (Nala, 1989). Thus, the role of technology has changed behaviour, actions, and spontaneous human activities into actions and activities that have been calculated scientifically. The selection of technology must consider the type of technology that is most appropriate to solve problems and is highly efficient for the user community, and is able to optimally utilize natural and human resources. This study uses two indicators to reflect technology, namely traditional technology and modern technology.

### *Small Craft Industry*

SHI is defined in various ways from various points of view by several experts and related agencies. The Ministry of Industry through the Decree of the Minister of Industry No. 286/M/SK/10/1989 and Bank Indonesia define small businesses based on the value of their assets; what is meant by small businesses are businesses whose assets (excluding land and buildings) are worth less than Rp. 600 million. Meanwhile, the Ministry of Trade limits small businesses based on their working capital; small businesses are businesses (trading) whose working capital is less than IDR 25 million.

The Indonesian Chamber of Commerce and Industry (Kadin) distinguishes small businesses into two groups, namely: (1) businesses engaged in trade, agriculture, and industry, (2) businesses engaged in construction. What is meant by small businesses for the first group are those with a working capital of less than Rp. 600 million. As for the second group, small businesses are those with a working capital of less than IDR 250 million and a business value of less than IDR 1 billion. From the point of view of net worth owned and annual sales value (State Ministry of Cooperatives and Small and Medium Enterprises), a small business is a business entity that has a net worth of at most Rp. 200,000,000, excluding land and buildings for business premises, and with annual sales of a maximum of Rp. 1,000,000,000.

Another definition is from the point of view of the number of workers used in the production process (Central Bureau of Statistics); a small business is a business entity that has a workforce of 5 to 19 people. The Ministry of Cooperatives

and Small and Medium Enterprises differs (Law No. 20 of 2008), that a small business is an entity that has the following criteria.

1. Net assets of more than Rp. 50,000,000.00 (50 million rupiahs) up to a maximum of Rp. 500,000,000.00 (500 million rupiahs) excluding land and buildings for business premises.
2. Annual sales of more than Rp. 300,000,000.00 (300 million rupiah) up to a maximum of Rp. 2,500,000,000.00 (2 billion 500 million rupiah).

SHI is part of the people's economy (Mubyarto, 1997), namely as an economic system based on people's power which has the following characteristics: (1) done by the people without big capital; (2) managed by means of self-help; (3) independence; (4) no workers and no employers; and (5) not pursuing profit. The substance of the SHI lies on the constitutional basis of the people's economy, namely Article 33 of the 1945 Constitution, in the first paragraph of the explanation section which includes three elements (Baswir, 2009).

The three elements are as follows: (1) participation of all members of society in the national production process; (2) participation of all people in enjoying the results of national production. This is in line with Article 27 paragraph 2 of the 1945 Constitution and Article 34 of the 1945 Constitution; and (3) the activity of production and the sharing of its products must have ownership of community members. Empowerment of the SHI has a high moral message, which includes efforts to improve welfare through empowering skilled and unskilled workers, increasing production capacity at the rural level so as to reduce the rate of urbanization of the productive age population, increasing national production capacity, and being able to increase foreign exchange earnings through the export market. All of these activities form a dependency network from upstream to downstream that is able to encourage multiplier effects and increase national economic growth.

Based on the perspective of its development, SHI can be classified into four types according to business performance (Rahmana, 2009). The four classifications in question are as follows: (1) livelihood activities are businesses that are used as job opportunities to earn a living, which are more commonly known as the informal sector; (2) a micro enterprise is a business of craftsmen but does not yet have an entrepreneurial nature; (3) a small dynamic enterprise is a business that has an entrepreneurial spirit and is able to accept subcontracting and export work; and (4) a fast moving enterprise is a business that already has an entrepreneurial spirit and will transform into a big business (Amalya and Widyaningsih, 2018).

SHI also has specific characteristics and is very different from large business groups (Tambunan, 2006), as follows: (1) there are many businesses and they are scattered in rural areas; (2) it is labour intensive and closely related to the agricultural sector; (3) it uses relatively simple technology; (4) many of them can grow significantly so that they can develop into big businesses; (5) although rural residents are generally low-income, they are able to save some of their income to invest in business activities; (6) most of the business funds they manage come



from their own capital; (7) the products produced are consumed by all groups of people, especially because the goods produced are simple goods; and (8) one of its advantages is its flexibility in production activities compared to large businesses.

There are at least four main reasons why SHI and other types of small businesses in Indonesia should be developed (Yustika, 2007). The four reasons are as follows: (1) the business structure in Indonesia is actually based on the existence of small/household/medium industries; (2) there are quite a lot of export-oriented industries, which really helps the country in earning foreign exchange; (3) the small business sector has proven to be more flexible in various unfavourable economic conditions; and (4) small business industrial products use more domestic raw materials or intermediate materials. SHI in this study uses Central Bureau of Statistics criteria, namely businesses that use between 5 to 19 workers.

## **Methodology**

This is quantitative research which is based on the philosophy of positivism; it is aimed at testing general theories to produce specific findings through hypothesis testing, collecting data, and data analysis (Sugiyono, 2010), which ends with generalizations. The research objects are: (1) business growth with indicators: Revenue growth and profit growth. (2) technology consisting of traditional and modern technology, and traditional technology components consisting of indicators like carving equipment, basic pattern-making equipment, and paint equipment. The components of modern technology consist of indicators like machines, information communication equipment, and transportation equipment. This study used a sample of 95 SHI; the method of determining the number of samples was stratified proportionate random sampling, while the method of selecting respondents was simple random sampling (Rengiah and Sentosa, 2016). The data from the field research were obtained through a questionnaire instrument, while the data analysis used structural equation modelling (SEM) based on partial least squares (PLS).

## **Findings and Discussions**

The average age of the respondents was 42.18 years; the youngest was 23 years and the oldest was 75 years. Age classification shows that the most dominant age is 40 years, meaning that the age of the respondent is closely related to work productivity. SHI is a modest industry that takes age and needs great morale, energy, and creativity. Of the total respondents that were analysed, it appears that almost 15% are under the age of 12 based on the average number of years in business for SHI, which is 14.80, with the youngest responder being 1 year old and the oldest being 49. This activity is the main source of income. In terms of education, the dominant business owner is an entrepreneur who graduated from high school (SLTA); the lowest level of education is elementary school and the highest is undergraduate (S1). The existence of SHI does not require a high

level of formal education; high school graduates can very adequately manage a business; the most important thing for SHI is that entrepreneurs have a good basis, skills, experience, and understanding of the type of business being managed. Skills in the craft sector are much more important than high formal education. The average number of workers used by SHI is 7.21 people; the lowest number of workers is 5 people and the highest is 19 people. The average sales per month are Rp. 8.21 million. The lowest sales are Rp. 2 million, and the highest Rp. 20 million per month. Furthermore, based on the results of the calculation of the field data, the results are as shown in Table 10.1.

The calculation results in Table 10.1 show that the dimensions of modern technology and traditional technology are able to reflect technology constructs significantly. The dimension of traditional technology has an effect of 0.886 and is significant on the technological construct, while the dimension of modern technology has a smaller effect on the technological construct, which is 0.767 and is significant. This means that the role of traditional technology is more dominant than modern technology. The results of the next analysis show that technology has a positive effect of 0.404 on business growth and is significant at the 0.05 level. The results of this analysis can be seen further graphically in Figures 10.1 and 10.2.

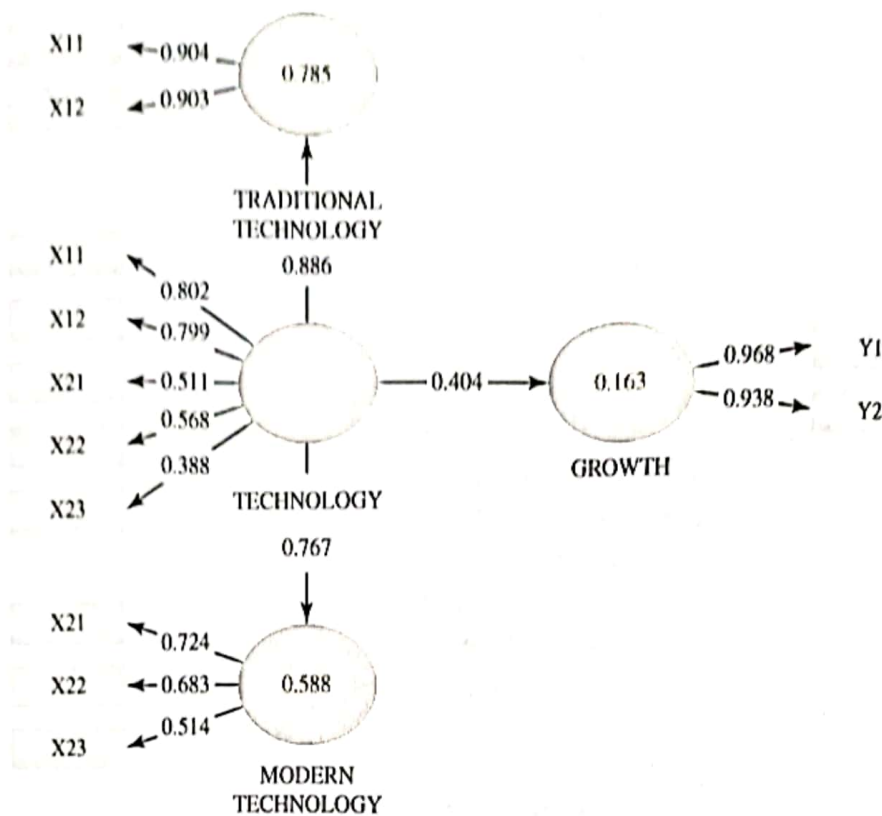
The results of the next analysis show that technology has a positive effect of 0.11 on business growth but is not significant at the 0.05 level. This is because the technology required is generally relatively simple, which is more dominant than traditional technology. They receive raw materials in a form that is ready to be worked on, so they don't do a lot of engineering of raw materials with modern technology. The second reason is that works of art cannot be done with modern technology such as machines; works of art take advantage of taste which is an expression of one's artistic soul which is different from others, and more must be done with a touch of the hand through the help of traditional technology. Besides, the artistic spirit has a unique character, which is difficult to imitate and cannot be forced so that it is relatively difficult to mass produce, because it is closely related to the satisfaction of the workers who work on it.

The results of this study are different from western theories and the results of previous studies regarding the importance of the role of technological improvement, including neoclassical theory (Todaro and Smith, 2006), Kuznets' 1966 study in the United States (Amir, 2008), Solow (Baier et al., 2006) in

*Table 10.1* Path analysis and T-test

<i>Construct/indicator</i>	<i>Original sample (O)</i>	<i>T Statistics ( O/STER)</i>	<i>Remark</i>
Technology → Growth	0.404	4.788	<b>Significant</b>
Technology → Modern	0.767	12.015	<b>Significant</b>
Technology → Traditional	0.886	35.950	<b>Significant</b>

(Source: The results of the calculation of the 2020 field survey data with PLS.)



*Figure 10.1* Technology usage and business growth model (source: The results of the calculation of the 2020 field survey data with PLS).

America between 1900 and 1949, Levy's study as in Husni (1994) in Iraq between 1961 and 1967, (Restuccia, 2004), Field in South Korea in 1961–1980 (Husni, 1994), and Amir (2008) in five developed countries, namely France, Japan, West Germany, England and the United States (Nakamura, 1981; Thatcher and Oliver, 2001; Kerr and Newell, 2003; and Wijono, 2005).

This study supports previous studies conducted in Indonesia by Amir (2008), and Bosworth, Collins, and Chen (1995) using data from 1964 to 1980. According to Amir (2008) technology is not the main variable in increasing business growth, but human resources are more important than technology. These results reinforce the position that the role of labour production factors is more dominant in encouraging business growth than technology. Capital provides a higher effect through labour production factors, meaning that the SHI is more labour intensive. This is very much in line with the reality on the ground, that SHI is a skill-based industry based on an artistic spirit, where indicators of talent and family environment are very important.

## Conclusion and Recommendations

Based on the results of this analysis, it can be concluded that technology has a positive effect of 0.11 on SHI business growth in Bali Province but is not significant at the 0.05 level. This is because the role of the expertise of the workforce that comes from natural talent and the family environment is more dominant in

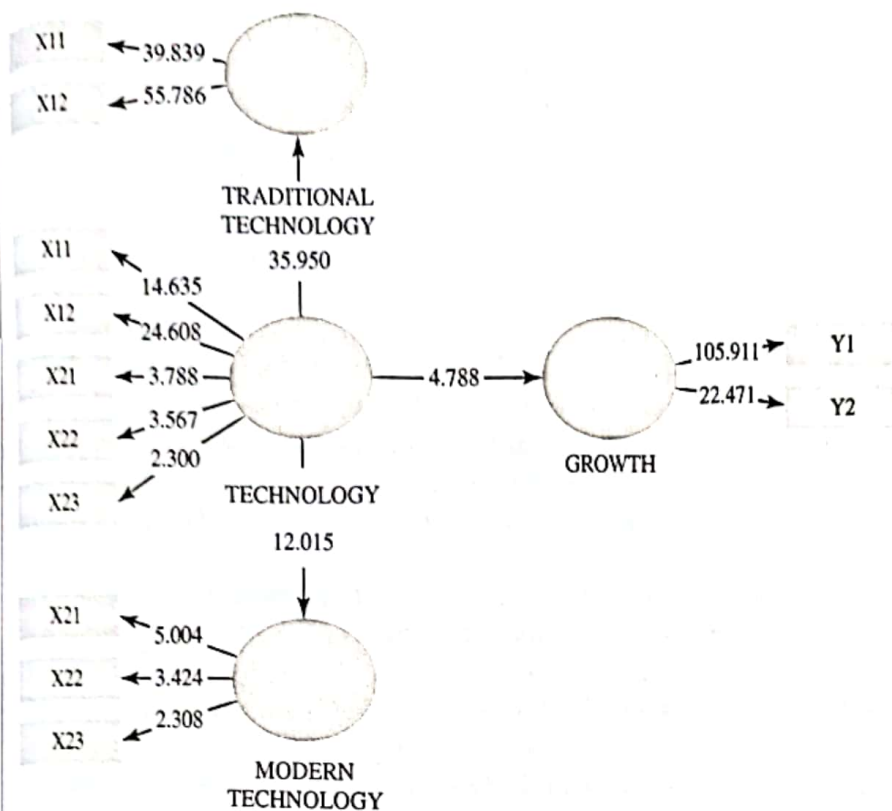


Figure 10.2 Bootstrapping model of business growth (source: the results of the calculation of the 2020 field survey data with PLS).

Table 10.2 Outer loading results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	PP Values
X11 <-TRADITIONAL TECHNOLOGY	0.904	0.902	0.023	39.839	0.000
X11<-TECHNOLOGY	0.802	0.801	0.055	14.635	0.000
X12 <- TRADITIONAL TECHNOLOGY	0.903	0.903	0.016	55.786	0.000
X12<-TECHNOLOGY	0.799	0.800	0.032	24.608	0.000
X21 <- MODERN TECHNOLOGY	0.724	0.698	0.145	5.004	0.000
X21<-TECHNOLOGY	0.511	0.497	0.135	3.788	0.000
X22 <- MODERN TECHNOLOGY	0.683	0.648	0.199	3.424	0.001
X22<-TECHNOLOGY	0.568	0.545	0.159	3.567	0.000
X23<-MODERN TECHNOLOGY	0.514	0.512	0.223	2.308	0.021
XZ3<-TECHNOLOGY	0.388	0.390	0.169	2.300	0.022
Y1 <- GROWTH	0.968	0.969	0.009	105.911	0.000
Y2 <- GROWTH	0.938	0.932	0.042	22.471	0.000

(Source: The results of the calculation of the 2020 field survey data with PLS.)

supporting business growth. The use of technology turns out to be more dominant with traditional technology compared to modern technology; this is due to the fact that SHI in Bali is more dominant in using a touch of art which cannot be helped much by modern technology that uses engine power or batteries. The element of skill with a touch of the hand is more important than modern technology.

## References

- Allen, R. G. D. (1967). *Macro-Economic Theory*. London: Macmillan and Co. Ltd.
- Amalya, M. D. and Widyaningsih, T. W. (2018). Implementation of Naive Bayes for classification and potentially MSMEs analysis. *MATEC Web of Conferences*, 218, pp. 1–8. <https://doi.org/10.1051/mateconf/201821802006>
- Amir, A. (2008). *Sumber-Sumber Pertumbuhan Ekonomi Indonesia*. Laporan Penelitian: FE/UNJA.
- Asia Pacific Foundation of Canada (2018). *Survey of Entrepreneurs and MSMEs in Indonesia*. Retrieved from: <http://www.asiapacific.ca> (accessed: 22nd December, 2021).
- ASIAN Productivity Organization (APO) (2019). *ASIAN Productivity Organization Databook*. Tokyo: APO.
- Baier, S. L., Dwyer, G. P. and Tamura, R. (2006). How important are capital and total factor productivity for economic growth. *Journal of Economic Inquiry*, 44(1), pp. 23–49.
- Bank Indonesia (2010). *Regional Economic Study of Bali Province, Quarter 2 of 2010*. Bali: Bank Indonesia.
- Barro, R. J. and Sala-i-Martin, X. (1999). *Economic Growth*. New York: MIT Press.
- Baswir, R. (2009). Industri Kecil dan Konglomerasi di Indonesia: Prospek Kemitraan. *Prisma*, 10 Tahun XXIV. Oktober.
- Bosworth, B. P., Collins, S. M. and Chen, Y. (1995). *Accounting for Differences in Economic Growth*. Brookings. Retrieved from: <https://www.brookings.edu/research/accounting-for-difference-in-economic-growth/> (accessed: 2nd December, 2021).
- Central Bureau of Statistics (2010). *Bali in Figures*. Bali: Central Bureau of Statistics.
- Central Bureau of Statistics (2016). *Economic Census of Bali Province*. Bali: Central Bureau of Statistics.
- Central Bureau of Statistics (2018). *Bali in Figures*. Bali: Central Bureau of Statistics.
- Central Bureau of Statistics (2019). *Bali in Figures*. Bali: Central Bureau of Statistics.
- Director General of Indonesian Small and Medium Industries (2018). *Small and Medium Industry Echo. Edition 60 March, 2018*. Jakarta: Director General of Indonesian Small and Medium Industries.
- Duan, Y., Mullins, R., Hamblin, D., Stanek, S., Sroka, H., Machado, V. and Araujo, J. (2002). Addressing ICTs skill challenges in SMEs: Insights from three country investigations. *Journal of European Industrial Training*, 26(9), pp. 430–441.
- Foreman-Peck, J., MakePeace, G. and Morgan, B. (2006). Growth and profitability of small and medium sized enterprises: Some Welsh evidence. *Regional Studies*, 40(4), pp. 307–319.
- Heidegger, M. (1977). *The Question Concerning Technology and Other Essays*. New York and London: Garland Publisher Inc.

- Husni, E. (1994). *Fungsi Produksi Cobb-Douglas Pada Industri Manufaktur di Indonesia*. Thesis. Jawa Barat: Universitas Indonesia.
- Inde, D. (1979). *Technics and Praxis: A Philosophy of Technology*. Dordrecht: Reidel Publisher.
- Kerr, S. and Newell, R. G. (2003). Policy induced technology adoption: Evident from the US lead phasedown. *The Journal of Industrial Economic*, 1, pp. 1-28.
- Ladokun, I. O. and Osunwole, O. (2013). Information and communication technology in small and medium enterprises: Factors affecting the adoption and use of ICT in Nigeria. *International Journal of Academic Research in Economics and Management Sciences*, 2(6).
- Layard, P. R. G. and Walters, A. A. (1978). *Microeconomic Theory*. New York: McGraw-Hill Book Co.
- Lim, F. (2008). *Filsafat Teknologi*. Yogyakarta: Kanisius.
- Mankiw, N. G. (2007). *Macroeconomics*. New York: Worth Publishers.
- Maupa, H. (2004). Faktor-faktor Penentu Pertumbuhan Usaha Kecil di Sulawesi Selatan. *Analisis*, 1(2).
- Meier, G. M. and Rauch, J. E. (2000). *Leading Issue in Economic Development*. Oxford: Oxford University Press.
- Mubyarto. (1997). *Ekonomi Rakyat, Program IDT, dan Demokrasi Ekonomi Indonesia*. Yogyakarta: Aditya Media.
- Nakamura, T. (1981). *The Japanese Economy its Development and Structure*. Tokyo: University of Tokyo Press.
- Nala, N. G. (1989). *Penerapan Teknologi Tepat Guna di Pedesaan*. Bali: P3M Unud.
- Prabawa, A. A. N. P. and Budhi, I. M. K. S. (2017). Pengaruh Modal, Tingkat Upah, dan Teknologi Terhadap Penyerapan Tenaga Kerja dan Produktivitas Pada Industri Sablon di Kota Denpasar. *E-Jurnal Ekonomi Pembangunan UNUD*, 6(7), pp. 1157-1184.
- Rahmana, A. (2009). Peranan Teknologi Informasi dalam Peningkatan Daya Saing Usaha Kecil Menengah. In Seminar Nasional Aplikasi Teknologi Informasi (SNATI) Yogyakarta, 20 Juni 2009.
- Rengiah, P. and Sentosa, I. (2016). The effectiveness of entrepreneurship education in developing entrepreneurial intention among Malaysian University Students: (A research findings on the structural equation modeling). *European Journal of Business and Social Sciences*, 5(2), pp. 30-43.
- Restuccia, D. (2004). Barrier to capital accumulation and aggregate total factor productivity. *Journal International Economic Review*, 45(1), pp. 238-255.
- Romer, P. (1986). Increasing return and long growth. *Journal of Political Economy*, 94(5), pp. 1002-1037.
- Simangunsong, F., Hutasoit, I. and Sentosa, I. (2019). A strategic framework of good governance, infrastructure development and community empowerment in Indonesian public sector management. *African Journal of Hospitality, Tourism and Leisure*, 2019(Special Issue), pp. 1-12.
- Sugiyono. (2010). *Metode Penelitian Kuantitatif Kualitatif & RND*. Bandung: Alfabeta.
- Suparmoko, I. M. (1990). *Ekonomi Pembangunan*. Penerbit: Yogyakarta-BPFE.
- Syahputra, R. (2017). Analisis Faktor-Faktor Yang Mempengaruhi Pertumbuhan Ekonomi Di Indonesia. *JURNAL SAMUDRA EKONOMIKA*, 1(2), pp. 183-191.

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