

The Impact of Technology on Economic Growth: A Analysis of Case Studies In Indonesia

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ABSTRACT

In Indonesia, the penetration of technology within government programs has become increasingly prevalent. Technology refers to the application of scientific knowledge for practical purposes, leading to the growth of tools, systems, and processes that enhance human capabilities and address societal needs. The method used in this study is to use qualitative methods using descriptive quantitative and qualitative. Using three steps through literature review, observation, and documentation. literatures on technology and economic growth are reviewed to generate a systematic mapping of concepts. Observational data from the Statistics of Indonesia, and government documents in the form of regulations and performance evidence serve as references for case studies. The Result of this study is Governments play a central role in shaping the trajectory of technological growth through the establishment of policies. The Indonesian government has recognized the importance of innovation in creating progress in the regions and has set regulations to encourage innovation in the regions. The Indeks Inovasi Daerah has been implemented to measure the level of innovation in the regions. Some priority areas in Indonesia that relate to the development of the country's digital economy and accelarting techology adoption. They are: Accelerating connectivity through infrastructure development, Fostering a capable digital society, Promoting trust in the digital economy, Empowering MSMEs, increasing quality of investment, Advancing digital tranformation for economic growth, and doing planning and program digitalization with consistency and sustainability.

Keywords: Technology; Growth; Digital Transformation; Regional Innovation

INTRODUCTION

Technology refers to the application of scientific knowledge for practical purposes, leading to the growth of tools, systems, and processes that enhance human capabilities and address societal needs. Economic growth, on the other hand, is the sustained increase in the production and consumption of goods and services within an economy. In this context, technology acts as a dynamic force propelling economic growth by fostering innovation, efficiency, and the creation of new markets.

The interplay between technology and economic growth holds profound implications for global societies. As we navigate an era characterized by rapid technological advancements, understanding this intricate relationship becomes crucial for policymakers, economists, and business leaders alike. The adoption and integration of innovative technologies have the potential to revolutionize industries, drive productivity gains, and reshape the labor market. Simultaneously, it introduces challenges such as job displacement, ethical considerations, and the need for regulatory frameworks that strike a delicate balance between innovation and societal well-being.

In Indonesia, the penetration of technology within government programs has become increasingly prevalent. The government has actively embraced technological advancements to enhance the efficiency, transparency, and accessibility of public services. Based on Article 388 paragraph (7) of Law Number 23 of 2014 about Regional Governments and Article 22 paragraphs (1) and (2) of Government Regulation Number 38 of 2017 concerning Regional Innovation. Economic growth Indonesia.

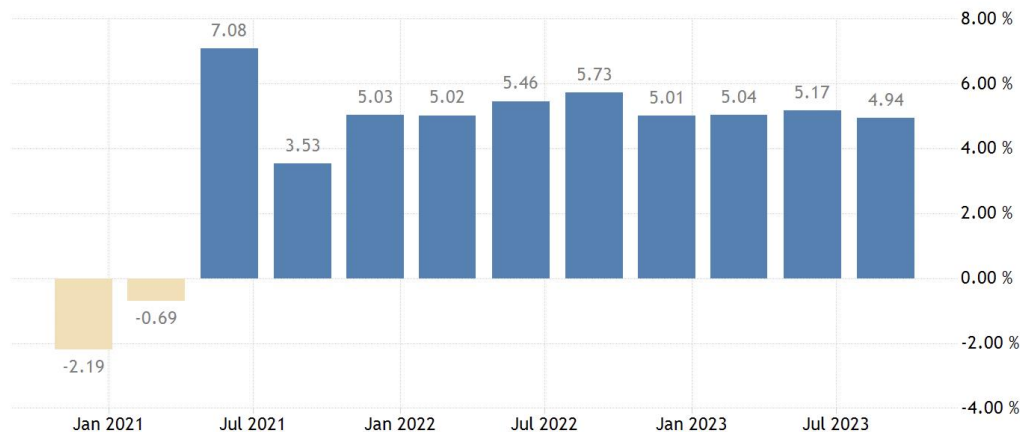


Figure 1. Economic Growth Indonesia 2021.1 – 2023.7

Source: BPS, Statistic Indonesia. 2023

Indonesia's economy expanded by 4.94% yoy in Q3 of 2023, softer than market forecasts of a 5.05% gain, slowing from a 5.17% expansion in Q2, pointing to the weakest growth since Q3 of 2021, due to easing household consumption and declines in government spending and exports, amid moderating commodity prices. Household consumption moderated (5.06% vs 5.22% in Q2), while government spending fell (-3.76% vs 10.57%). Also, net trade contributed negatively amid faster drops in both exports (-4.26% vs -2.97%) and imports (-6.18% vs -3.80%). Meanwhile, fixed investment continued to expand (5.77% vs 4.63%). On the production side, output growth softened for agriculture (1.46% vs 2.02% in Q2), wholesale & retail trade (5.08% vs 5.26%), and health services (2.92% vs 8.27%). Output continued to grow for manufacturing (5.20% vs 4.88%), mining (6.95% vs 5.01%), communication (8.52% vs 8.05%), and construction (6.39% vs 5.23%). The government for this year predicted the economy to grow by 5.1%. (Statistics Indonesia).

This paper seeks to delve into the dynamic interconnection between technology and economic growth, analyzing historical patterns, current trends, and future trajectories. By

examining case studies, addressing challenges, and proposing informed policy recommendations, we aim to present a nuanced perspective on how societies can navigate the evolving landscape of technology-driven economic growth to foster innovation, inclusivity.

METHOD

The method used in completing this research is by using a qualitative approach. In analyzing using descriptive analysis where the results are described in narrative form. Qualitative descriptive research aims to gain a general understanding of social reality which is the focus of research. This general understanding comes from the participant's perspective, not predetermined by the researcher. Then, an analysis and deepening of these social realities is carried out, then a conclusion is drawn in the form of a general understanding regarding these realities (Rukhmana et al., 2022).

Data collection techniques carried out by researchers are using library research and field research. At the library research stage, the writer examines the results of previous research in the form of scientific publications (scientific articles and scientific journals). While at the field research stage there are 3 steps through literature review, observation, and documentation.

Some of literatures on technology and economic growth are reviewed to generate a systematic mapping of concepts. Observational data from the Statistics of Indonesia, and government documents in the form of regulations and performance evidence serve as references for case studies.

Based on the three stages of the above method, it will demonstrate a linear relationship between technology and growth. The case study will be presented descriptively, outlining the current conditions in Indonesia and predictions based on various research institutions. In terms of policy aspects, it will be discussed how the government is making efforts to integrate technological transformation into government programs, particularly through regional innovation initiatives.

RESULT AND DISCUSSION

The evolution of technology has been a driving force behind transformative shifts in economic paradigms throughout history. As societies progressed from agrarian economies to industrialized ones, technological innovations became catalysts for unprecedented economic growth (Mokyr, 1990). The mechanization of production processes during the Industrial Revolution, for instance, not only revolutionized manufacturing but also laid the foundation for mass production and the rise of urban centers.

The evolution continued with subsequent waves of technological advancements, including the harnessing of electricity, the advent of telecommunications, and the rise of the digital era. Each phase of technological evolution has reshaped industries, altered labor markets, and redefined the very nature of economic transactions, influencing the global economic landscape.

Several key technological revolutions have punctuated the course of economic history, fundamentally altering the ways in which societies produce, consume, and exchange goods and services. The Industrial Revolution, characterized by the mechanization of production processes in the late 18th century, marked a watershed moment that transitioned economies from agrarian to industrial (Hobsbawm, 1962).

The Information Age, beginning in the latter half of the 20th century, brought about the digitization of information, the advent of computers, and the rise of the internet, revolutionizing communication, commerce, and knowledge sharing on a global scale (Castells, 1996). These technological revolutions have not only spurred economic growth but have also catalyzed societal transformations, redefining the very fabric of human existence.

The historical patterns of economic growth are intricately interwoven with the trajectory of technological advancements. The phases of rapid economic expansion often coincide with periods of technological innovation. For instance, the post-World War II era witnessed significant economic growth fueled by technological advancements in manufacturing, transportation, and communication (Nordhaus, 2004). Similarly, the more recent era of the digital revolution has been accompanied by notable economic growth patterns, with technology-intensive industries becoming key contributors to national GDPs. Understanding these historical linkages provides valuable insights into the role technology plays as a primary driver of economic growth.

In the contemporary era, the relationship between technology and the economy has reached an unprecedented level of intricacy, reshaping the global landscape. An overview of the current technological landscape reveals a tapestry woven with groundbreaking advancements, including Artificial Intelligence (AI), the Internet of Things (IoT), Blockchain, and more. AI, with its capacity for machine learning and cognitive computing, is altering how businesses operate and make decisions, while IoT connects devices and systems, creating a networked environment that enhances efficiency across industries. Blockchain, renowned for its secure and transparent decentralized ledger technology, is disrupting traditional models of data management and financial transactions. These technologies collectively constitute a paradigm shift, propelling the global economy into a new era marked by unprecedented connectivity, innovation, and transformative potential.

The digital age has ushered in transformative economic trends, fundamentally altering how nations engage in commerce, innovation, and trade. One of the defining trends is the rise of the digital economy, where digital technologies serve as the primary drivers of economic activity. Within the annals of the tech-driven economic landscape, Silicon Valley stands as an iconic success story, emblematic of the transformative power of innovation. Silicon Valley, located in the southern part of the San Francisco Bay Area, has evolved into a global hub of technology and entrepreneurship. It has incubated and nurtured some of the world's most influential tech companies, including Apple, Google, and Facebook. The success of Silicon Valley is attributed to a unique ecosystem that fosters collaboration, attracts top talent, and encourages risk-taking. Beyond Silicon Valley, other regions globally, such as Shenzhen in China, have also emerged as tech-driven economic success stories, illustrating the replicability of innovation ecosystems.

Key Factors Driving that is, Innovation and Research & Development (R&D), Startups and Entrepreneurship, digital transformation in Industries and Workforce skill development. The keys are dependent to the government policy.

In the ever-evolving landscape of technological integration, several pivotal factors emerge as catalysts for driving sustained economic growth. Innovation and Research & Growth (R&D) stand at the forefront, serving as the bedrock upon which transformative technologies are built. Investments in R&D not only foster groundbreaking discoveries but also propel industries into new realms of efficiency and competitiveness (Mowery & Rosenberg, 1989). The emergence of innovative technologies is intricately linked with the dynamism of entrepreneurial ecosystems, where Startups and Entrepreneurship play a pivotal role. Startups, with their agility and risk-

taking capacity, serve as crucibles for experimentation and the birth of disruptive technologies, acting as engines of economic rejuvenation (Audretsch & Feldman, 1996).

Moreover, the ongoing process of Digital Transformation in Industries has become a linchpin for economic growth. As industries across sectors embrace digitization, automation, and data analytics, they unlock new avenues for efficiency, cost-effectiveness, and enhanced customer experiences (Westerman et al., 2014). This digital metamorphosis reshapes traditional business models and fuels the emergence of novel industries. As industries undergo these transformations, the demand for a skilled and adaptable workforce becomes paramount. Hence, Workforce Skill Growth becomes a critical factor, ensuring that individuals are equipped with the skills required in an increasingly tech-driven job market. Government initiatives, corporate training programs, and educational reforms play key roles in nurturing a workforce capable of harnessing the potential of emerging technologies (Bessen, 2019).

In summation, the synergy of innovation, entrepreneurial spirit, digital transformation, and a skilled workforce forms the nexus through which technology propels economic growth, shaping the contours of future prosperity.

Examining the impact of technology on economic growth becomes even more enlightening when analyzed through the lens of specific countries or regions, each shaped by its unique socio-economic context and technological landscape. For instance, considering the economic ascent of China, a paradigm often attributed to its strategic investments in technology and innovation, sheds light on how a deliberate focus on technological advancements can propel a nation's economic prowess on the global stage (Kaplinsky & Köhler, 2022).

In the dynamic interplay between technology and economic growth, examining failures and missteps becomes an essential facet of understanding the complexities inherent in their relationship. Throughout history, various instances stand as cautionary tales where the implementation or integration of certain technologies did not yield the anticipated positive outcomes. The dot-com bubble burst of the late 1990s and the subsequent market crash serve as a poignant example, revealing the dangers of speculative investments in technology companies with unsustainable business models (Popper, 2021).

Indonesia has made significant strides in digitalization and technological transformation, which have contributed to the country's economic growth potential. The government recognizes the importance of internet access and connectivity in addressing the nation's digital divide, developing adaptive ICT skills, and promoting digital literacy. The country's digital economy is the largest market in Southeast Asia, and it has grown at an impressive rate of 414% from 2017 to 2021, projected to reach USD 130 billion by 2025 (IMF, 2022). The Ministry of Finance predicts that Indonesia's economy could gain as much as \$2.8 trillion by 2040 through technology adoption. Indonesia has produced its own multi-billion-dollar tech platforms, a home-grown "super-app," and numerous tech startups, ranking sixth in the world in terms of the number of startups with about 2,500 in 2023. The country's fintech sector is one of its most promising industries, generating USD 8.6 billion worth of revenue by 2025 (mckinsey, 2020).

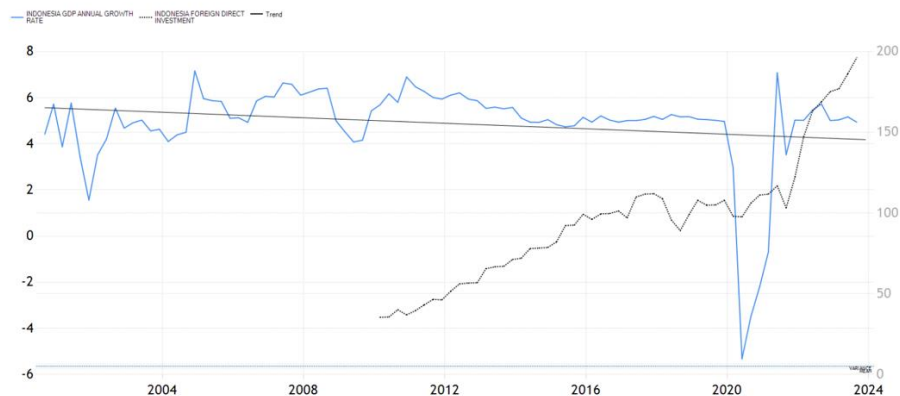


Figure 2. GDP and Indonesia FDI, 2003-2023

Source: tradingeconomic, statistics Indonesia. 2023

The figure above that illustrates the trends of GDP and Foreign Direct Investment (FDI) in Indonesia. Economic growth shows a gradual slope, while FDI growth is highly aggressive. Increased investment is undertaken to drive digital transformation in Indonesia.

Indonesia has also used digitalization to accelerate inclusive development, reaching the poor with better-targeted social assistance, national identification programs, and financial services. In conclusion, Indonesia's technological transformation and digitalization have contributed to the country's economic growth potential, with the government recognizing the importance of internet access and connectivity in promoting digital literacy and addressing the nation's digital divide. The country's digital economy is the largest market in Southeast Asia, and it has produced its own multi-billion-dollar tech platforms, a home-grown "super-app," and numerous tech startups. The fintech sector is one of the country's most promising industries, generating significant revenue by 2025.

In Indonesia, the government has recognized the importance of innovation in creating progress in the regions. The government has set regulations to encourage innovation in the regions, which are outlined in the Peraturan Pemerintah (PP) Nomor 38 Tahun 2017 tentang Inovasi Daerah. The regulation defines three forms of regional innovation: (a) innovation in regional governance; (b) innovation in public services; and (c) other regional innovations according to government affairs. These three forms of innovation must meet several principles, including improving efficiency, effectiveness, and service quality, being open, and being accountable. Innovation is essential for development, and the government has taken steps to encourage innovation in the regions.

The government has implemented an *Indeks Inovasi Daerah* (Regional Innovation Index) to measure the level of innovation in the regions. The index is a set of variables and indicators used to measure the level of innovation in the regions based on a specific period. The index consists of eight variables, including institutions, human resources, innovation ecosystems, infrastructure studies, knowledge and technology output, business process speed, product sophistication, and the number of innovations and creative results. The government hopes that the index will motivate regional governments to increase their creativity and innovation in implementing programs and policies in all aspects of regional governance.

As we venture into the future, the landscape is marked by the emergence of groundbreaking technologies that have the potential to redefine the economic terrain. Technologies such as artificial intelligence (AI), quantum computing, and biotechnology are at the forefront of innovation, promising transformative impacts across various industries (Schwab, 2016). The traditional models of production, distribution, and consumption are likely to undergo significant shifts. The gig economy, propelled by digital platforms and connectivity, may become more prevalent, altering the nature of work and employment relationships (Manyika et al., 2016). Furthermore, the rise of decentralized technologies like blockchain has the potential to reshape traditional financial structures, enabling more secure and transparent transactions.

The rapid pace of technological innovation brings forth not only economic implications but also profound societal impacts. Increased connectivity and the advent of smart technologies may lead to more interconnected societies, offering new avenues for collaboration and communication (Rifkin, 2014). However, concerns about privacy, security, and the potential exacerbation of existing societal divides also come to the forefront (van Dijck, 2014). Additionally, the ethical considerations surrounding emerging technologies, such as AI and biotechnology, raise questions about responsible growth and deployment. Navigating these societal and economic implications requires a holistic approach that prioritizes inclusivity, ethical considerations, and the collective well-being of communities.

Governments play a central role in shaping the trajectory of technological growth through the establishment of policies that strike a delicate balance between innovation and the safeguarding of societal interests. Governments can play a pivotal role in creating an environment conducive to technological advancements by investing in research and growth, offering incentives for innovation, and establishing clear regulatory guidelines that promote fair competition and consumer protection (Autor et al., 2022).

CONCLUSION

The Indonesian government has recognized the importance of innovation in creating progress in the regions and has set regulations to encourage innovation in the regions. The Indeks Inovasi Daerah has been implemented to measure the level of innovation in the regions, and the government hopes that it will motivate regional governments to increase their creativity and innovation in implementing programs and policies in all aspects of regional governance.

Some priority areas in Indonesia that relate to the development of the country's digital economy and accelerating technology adoption. They are: Accelerating connectivity through infrastructure development, Fostering a capable digital society, Promoting trust in the digital economy, Empowering MSMEs, Advancing digital financial services for economic growth, and doing planning and program digitalization with consistency and sustainability.

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