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The Role of Human Resources and Technological Advancement on Economic Growth

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Abstract
This study aims to comprehensively examine the role of human resources and technological advancement in driving economic growth. Employing a qualitative literature review approach, secondary data were gathered from peer-reviewed academic sources, including scholarly journals, international conference proceedings, and academic books published between 2015 and 2025. The findings reveal that human capital development significantly contributes to labor productivity, innovation, and macroeconomic stability. Similarly, technological advancement accelerates economic growth by enhancing production efficiency, reducing operational costs, and creating new market opportunities. The study underscores the critical synergy between high-quality human capital and effective technology adoption as a foundational mechanism for achieving inclusive and sustainable economic development. Policy implications suggest that developing countries should adopt integrated development strategies by investing in education, vocational training, and digital infrastructure, alongside strengthening national innovation systems. Consequently, enhancing both human and technological capacities is essential for building resilient, knowledge-based economies capable of adapting to global dynamics.

Keywords: Economic growth, human capital, technological advancement.

1. Introduction

Economic growth is a crucial indicator for measuring a country's capacity and progress (Muhammad Fadhel Alfayed, Puti Andiny, Yani Rizal, & Safuridar Safuridar, 2024). An increase in economic growth reflects an expansion in the production of goods and services (Puspita, Devi, Nisa, & Noviarita, 2025; Putri & Idris, 2024), which in turn enhances societal welfare (Soleh, 2015). In a dynamic global context, economic growth is influenced by various complex factors, including the quality of human resources (HR) (Saleh, Surya, Annisa Ahmad, & Manda, 2020) and technological advancement (Mohamed, Liu, & Nie, 2022; Rifai, Gunanto, & Susilo, 2021). Both are fundamental, interrelated elements that significantly contribute to productivity, efficiency, and innovation within an economy.

Human resources, as intellectual and labor assets (Mamulati, Triyuwono, & Mulawarman, 2016), play a central role in driving economic activity (Huyen, 2023;

Yaqien, Chamariyah, & Hartati, 2022). High-quality HR can produce superior and innovative outputs (Rahmawati, Al-Habsyi, & Mardiyah, 2024). Investments in education, training, and HR development are critical for enhancing labor productivity and a country's competitiveness in the global market. Countries with skilled workforces tend to experience higher economic growth compared to those that neglect HR development. This is because a skilled workforce can adapt to technological changes, generate new innovations, and improve production efficiency.

On the other hand, technological progress is also a key driver of economic growth (Afriyadi et al., 2024; Gultom, Hutabarat, Dirgantara, Pratama, & Hidayah, 2024; Puspita et al., 2025). According to Elfaki & Ahmed (2024), technological innovation has provided solutions to human needs and has the potential to serve as a new catalyst for economic growth and social improvement. Consequently, countries capable of adopting and developing new technologies tend to achieve higher economic growth than those lagging in technological advancement. However, the relationship between HR, technology, and economic growth is not always linear and positive. In some cases, technological progress may lead to structural unemployment if not accompanied by workforce upskilling and adaptation (Firdausi, 2024). Therefore, a deeper examination of the roles of HR and technology in economic growth is essential.

Although numerous studies have explored the relationship between HR, technology, and economic growth, few have conducted a comprehensive analysis. This study aims to address these gaps by analyzing the roles of HR and technological advancement in economic growth in developing countries, while considering relevant contextual factors. More specifically, this research seeks to provide an in-depth and comprehensive analysis of how HR and technological progress influence economic growth, with a focus on developing nations. The study aims to offer robust insights into the impact of HR and technology on economic growth. The findings are expected to provide relevant policy implications for governments and industry stakeholders in developing countries to foster inclusive and sustainable economic growth. Additionally, this research is anticipated to contribute significantly to theoretical understanding of the complex interplay between HR, technology, and economic growth.

2. Method

This study employs a qualitative literature review approach based on secondary data to comprehensively examine the roles of human capital and technological advancement in economic growth. Data were obtained from relevant scholarly sources, including peer-reviewed journal articles, international conference proceedings, academic books, and other supporting documents published between

2015 and 2025. The literature search was conducted systematically using keywords such as *"human capital and economic growth," "technology advancement and economic development,"* and *"developing countries."*

The literature selection process was guided by specific inclusion criteria: (1) publications must have undergone peer review, and (2) the content must focus on the contribution of human capital and/or technology to economic growth. Articles that did not meet methodological standards or lacked substantial relevance were excluded. Selected literature that met the criteria was analyzed to identify thematic patterns underlying the relationship between human capital, technology, and economic growth. Data analysis employed a thematic synthesis approach, which involved categorizing findings into major themes, such as the contribution of human capital and the role of technology in driving economic growth. The synthesis aimed to draw integrative conclusions, identify research gaps, and formulate strategic policy implications that may support inclusive and sustainable economic growth.

3. Results and Discussion

3.1 The Role of Human Resources (HR) in Economic Growth

The role of human resources (HR) in economic growth has been a significant concern in development economics literature. The literature review reveals that high-quality human capital is a key driver of economic growth (Sarwar, Khan, Sarwar, & Khan, 2021). Improvements in workforce skills and education have been shown to accelerate production processes, enhance efficiency, and boost national productivity. The reviewed studies consistently identify human capital quality as a strategic element in strengthening a country's competitiveness in the global market.

Several studies emphasize that countries with high levels of investment in human capital development tend to experience faster economic growth. Education and vocational training directly contribute to forming an economic growth. According to Brodny & Tutak (2024), countries that allocate substantial investment in education tend to exhibit higher rates of GDP growth. Educational attainment serves as a catalyst for enhancing labor productivity, which subsequently contributes to greater economic output and income generation. This has a direct impact on increasing output across major sectors of the economy. Thus, human capital development should be viewed not only as a social agenda, but as a concrete economic instrument.

The quality of human capital is also closely linked to a country's ability to generate innovation and manage resources effectively (Hafiluddin & Widiastuti, 2025). An educated workforce is more likely to develop higher productivity, lower costs, increased innovation, and efficient decision making (Farooq & Bakhadirov, 2022). Moreover, enhancing human capital capacity contributes to cost efficiency in economic activities. Competent workers complete tasks more quickly and accurately

(Sutarman, Kadim, & Garad, 2024), reducing production costs and increasing profit margins. This efficiency contributes to macroeconomic growth by facilitating business expansion and value creation.

The literature also highlights that increased labor productivity is one of the main channels through which human capital affects economic growth (Fatimah, Sulaiman, Jumadil, & Suriyani, 2021). High productivity reflects the ability of human capital to generate more output with the same input. Countries that manage to improve labor productivity typically experience significant increases in economic growth (Yu, Dilanchiev, & Bibi, 2024).

The impact of human capital on economic growth is also evident in the workforce's role in maintaining economic stability (Minhaj & Ahmed, 2023). Knowledgeable and skilled labor is better able to adapt to changes in the labor market, reducing the risk of long-term unemployment. This adaptability is critical to sustaining economic growth, especially amid structural transformations. In essence, findings from various sources affirm that human capital is a productive asset that directly influences the pace and quality of economic growth. Sustainable economic development requires continuous investment in human capacity building through education, training, and skills development aligned with market needs.

3.2 The Role of Technological Advancement in Economic Growth

Technological advancement has been widely recognized as one of the main drivers of economic growth in contemporary literature (Ding, Liu, Zheng, & Li, 2021). According to Lee (2024), It is indispensable to economic growth. The findings of this review reveal that the adoption of modern technologies—such as digitalization, automation, and artificial intelligence—positively contributes to increasing production efficiency and expanding national economic capacity (Hamada, 2025; Park & Choi, 2019; Vărzaru & Bocean, 2024). Technology enables faster, more accurate, and cost-effective production processes, thereby enhancing total factor productivity (TFP), a key component of long-term economic growth (Ferdinan, 2013).

The literature also highlights that technology not only improves efficiency but also creates new economic opportunities by transforming business models and generating previously non-existent markets (Kraus et al., 2021; Saladin & Faoziyah, 2024; Vărzaru & Bocean, 2024). For instance, the digital economy, e-commerce, and financial technology sectors have expanded economic participation for previously marginalized groups, thereby contributing to more inclusive growth.

Although the overall impact is generally positive, several studies also point to the disruptive effects of technological advancement on labor market structures (Novakova, 2020). Automation and digitalization, when not accompanied by improved workforce skills, may lead to structural unemployment (Schmidpeter &

Winter-Ebmer, 2021). Badiuzzaman & Rafiquzzaman (2020) emphasizes that labor-intensive sectors are particularly vulnerable to replacement by machines and automated systems. Therefore, the economic benefits of technology are highly dependent on human capital readiness and the presence of policies to mitigate potential negative impacts.

Furthermore, technology enhances a country's international competitiveness (Dosi, Grazzi, & Moschella, 2015). Nations that are able to develop or adopt advanced technologies more rapidly tend to achieve stronger positions in global trade. Literatures noted that technological innovation enables the creation of superior products and services while improving efficiency across global supply chains (Salamah, Alzubi, & Yinal, 2023; Wang, Han, Ma, & Tan, 2024). In this regard, innovation and research policies serve as crucial instruments in driving a knowledge-based economy.

Finally, the literature review confirms that technological advancement significantly contributes to economic growth—primarily through improved efficiency, the creation of new economic opportunities, and enhanced national competitiveness. However, this contribution can only be fully realized if supported by adequate digital infrastructure, innovation policies, and quality human capital. Thus, technological advancement must be accompanied by a holistic development approach to ensure inclusive, adaptive, and sustainable economic growth.

4. Conclusion

The findings of this literature-based investigation affirm that both human resources and technological advancement serve as pivotal drivers of economic growth. Human capital development enhances labor productivity, fosters innovation, and strengthens macroeconomic stability through a skilled and adaptable workforce. Likewise, technological advancement contributes significantly to economic expansion by improving production efficiency, reducing costs, and enabling the emergence of new market opportunities. Importantly, the synergy between these two factors—well-developed human capital and effective technology adoption—constitutes a foundational mechanism for achieving sustained and inclusive economic growth.

In light of these findings, it is imperative for policymakers, particularly in developing economies, to adopt integrated strategies that simultaneously strengthen human capital and foster technological innovation. Investments in education, vocational training, and digital infrastructure must be aligned with the demands of evolving labor markets and technological shifts. Furthermore, national innovation systems should be enhanced through supportive policies that encourage research, development, and the diffusion of technology. By pursuing a comprehensive development framework that prioritizes both human and technological capacity,

countries can optimize their growth trajectories and build resilient, knowledge-based economies.

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