Indonesian Journal of Education (INJOE) e-ISSN: 2810-059X
Vol. 4 No. 3, December 2024, pages: 900~913

EDUCATION INNOVATION AND DIGITALISATION AS THE KEY TO GLOBAL COMPETITIVENESS

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Abstract

In the era of globalisation and industrial revolution 4.0, innovation and digitalisation of education have become crucial factors in improving the global competitiveness of a nation. The research method used in this study is literature. The results show that effective integration of technology in the education system can create a learning environment that is more adaptive, personalised and relevant to the needs of the global market. Therefore, the importance of a holistic approach that considers aspects of accessibility, data security, and inclusion in the process of digitalisation of education.

Keywords: Innovation, digitalisation, education, global competitiveness.

Introduction

In the era of globalisation and rapid technological advancement, education faces great challenges to remain relevant and able to produce globally competitive human resources (Sitopu et al., 2024). Rapid changes in the economic, social and technological landscape require education systems to adapt and innovate to prepare future generations for the complexities of the modern world (Guna et al., 2024); (Fawait et al., 2024).

Educational innovation refers to the process of introducing and implementing new ideas, methods or technologies in the education system with the aim of improving the effectiveness and efficiency of learning processes and educational outcomes. This includes the development of more relevant curricula, the implementation of more interactive and learner-centred teaching methods, and the use of technology to support the teaching-learning process (Sizova et al., 2020). Educational innovation aims to create a learning environment that is more dynamic, inclusive and suited to the needs of learners in the modern era, preparing them for the challenges of the future (Fiofanova, 2020).

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Digitalisation of education refers to the comprehensive transformation of the education system by integrating digital technologies into every aspect of the learning, teaching and education management processes. It involves the use of hardware (such as computers, tablets, and smartphones), educational software, online learning platforms, as well as emerging technologies such as artificial intelligence (AI) and virtual reality (VR) in the context of education (Bai & Lin, 2022); (Sartika & Fransiska, 2024; Syakhrani & Aslan, 2024). Digitalisation of education is not only about replacing traditional methods with technology, but also about creating more personalised, interactive, and accessible learning experiences, as well as enabling the collection and analysis of educational data for better decision-making (Charlebois et al., 2022).

The Industrial Revolution 4.0 and the rise of the knowledge-based economy have changed the way we live, work and learn. The skills required in today's global labour market are much different than in previous decades. Creativity, complex problem solving, adaptability and digital literacy are key competencies that education graduates must possess to compete on a global level (Batrakova, 2022). However, many education systems in various countries still use conventional approaches that no longer fit the needs of the times. Teacher-centred learning methods, rigid curricula and underdeveloped educational infrastructure are barriers to producing graduates who are ready to face global challenges (Vásquez-Bernal et al., 2024).

On the other hand, the COVID-19 pandemic has accelerated the massive adoption of digital technology in education. Distance learning and blended learning have become the new norm, forcing educational institutions to adopt digital solutions in a short period of time. This situation opens up new opportunities and challenges in the digital transformation of education (Iksal et al., 2024); (Judijanto et al., 2024).

Countries that have successfully integrated innovation and digitalisation in their education systems have shown significant improvements in education quality and global competitiveness. Finland, Singapore and South Korea, for example, have long been recognised as leaders in education innovation and consistently rank at the top of various international education assessments (Rahardja, 2022).

Given the importance of education in a country's economic and social development, as well as its role in enhancing global competitiveness, it is crucial to further examine how innovation and digitalisation can be key in transforming the education system.

Research Methods

The study in this research uses the literature research method. This method is a systematic approach to collecting, analysing and synthesising information from various written sources relevant to a particular research topic. (Sahar, 2008); (Arikunto;, 2000); (Fadli, 2021).

Results and Discussion

The Concept of Innovation in Education

Innovation in education can be defined as the process of introducing and implementing new ideas, methods or technologies that aim to improve the quality and effectiveness of the teaching-learning process. The concept includes creative changes in curriculum, teaching strategies, use of technology, design of learning environments or assessment systems that aim to improve student learning outcomes, develop 21st century skills and prepare them for future challenges (Kolesnyk et al., 2022). Educational innovation is not only limited to the introduction of new tools or techniques, but also involves a paradigm shift in the way of thinking about education, which encourages learning that is more personalised, interactive and relevant to the needs of modern society (Velev et al., 2023).

The concept of innovation in education is a dynamic approach that aims to improve the quality and relevance of the education system in facing the challenges of a changing world. It not only includes the introduction of new technologies, but also involves fundamental changes in the way of thinking about the teaching-learning process. This includes the development of more effective teaching methods, more flexible and relevant curriculum design, and the creation of learning environments that are more conducive to learners' cognitive and socio-emotional development (Mubarok & Umami, 2020).

In modern contexts, educational innovation often focuses on the personalisation of learning, where technology and data are used to tailor learning experiences to the individual needs, interests and abilities of each student. This includes the use of adaptive learning platforms, virtual and augmented reality to increase student engagement, and the implementation of more comprehensive and process-orientated assessment methods. In addition, innovation also includes the development of 21st century skills such as critical thinking, creativity, collaboration and digital literacy, which are considered essential for success in the information age (Smirnov, 2020).

However, it is important to remember that innovation in education is not just about adopting the latest technology or following trends. It is an ongoing process that requires critical evaluation of existing practices, experimentation with new ideas, and adjustments based on feedback and results. Effective innovation also considers the social, cultural and economic context in which education takes place and involves all stakeholders - including educators, students, parents and communities - in the change process. The ultimate goal is to create an education system that is more inclusive, responsive and able to prepare learners for the complexity and uncertainty of tomorrow's world.

Digitalisation of Education

Digitalisation of education refers to a comprehensive transformation process in the education system that involves the integration of digital technologies into various aspects of learning, teaching, and education management. The concept encompasses the use of hardware (such as computers, tablets and smartphones), software (such as online learning platforms, educational apps and learning management systems) and internet connectivity to improve access, quality and efficiency of education (Irwan et al., 2024); (Tubagus et al., 2023); (Aslan & Shiong, 2023). Digitalisation of education does not only involve replacing traditional teaching materials with digital versions, but also includes fundamental changes in teaching methodologies, the way students interact with learning materials, assessment processes, and even the institutional structure of education. The aim is to create learning environments that are more interactive, personalised and relevant to the needs of the digital age, while preparing learners with the skills necessary for success in an increasingly digitally connected society (Gertsik, 2020).

The level of digitisation of education can be understood as a spectrum that describes the extent to which digital technologies have been integrated into the education system. At the most basic level, digitalisation may only involve the use of computers and the internet for administrative tasks or as occasional teaching aids (Moroshkina, 2020). Meanwhile, at a higher level, we see a complete transformation where digital technology becomes an integral part of every aspect of education - from teaching and learning methods to assessment and school management. This level of digitisation can vary significantly from one institution to another, even within a single country, depending on factors such as infrastructure, resources, education policies and the readiness of teachers and students (Sijabat & Hidayati, 2024).

At the most advanced level, digitisation of education includes the use of advanced technologies such as artificial intelligence (AI) for personalisation of learning, virtual and augmented reality for immersive learning experiences, learning analytics to track and improve student performance, and online learning platforms that allow access to education without geographical restrictions (Popa & Chistruga, 2024). At this level, education is no longer limited to physical classrooms but becomes a digitally integrated, flexible and accessible experience anytime and anywhere. However, it is important to note that a high level of digitisation does not necessarily mean better educational outcomes; its effectiveness depends largely on how the technology is implemented and used to support clear pedagogical goals (Riznyk, 2024).

Furthermore, it is important to understand that digitalisation of education is not just about technology, but also about cultural and mindset change. It involves a shift from the traditional teacher-centred model of education to a more student-centred model, where technology enables more independent, collaborative and individualised learning. This process also requires the development of strong digital skills among

educators and learners, as well as an understanding of digital ethics and online safety (Alhammoud et al., 2021).

Challenges in the digitalisation of education also need to be addressed. These include access issues and the digital divide, where not all students or schools have equal access to technology and the internet. In addition, there are concerns about data privacy, cybersecurity and the potential negative impact of excessive technology use on children's social and emotional development. Therefore, the implementation of digitalisation of education should be done with caution and consider these various aspects (Zaverbnyj et al., 2024).

Nonetheless, the potential benefits of digitising education are immense. These include improved access to quality educational resources, the ability to tailor learning to students' individual needs, increased efficiency in education administration, and the preparation of students for an increasingly digitalised world of work. Digitalisation also opens up opportunities for lifelong learning and continuous skills development, which are increasingly important in an era of rapid technological change (Varga, 2020).

In conclusion, the digitisation of education is a complex yet essential transformative process in dealing with the demands of the digital age. It is not just about replacing books with tablets or whiteboards with digital screens, but about changing the way we understand and deliver education. The success of digitising education depends on a holistic approach that considers technological, pedagogical, social and ethical aspects. With the right implementation, digitalisation can open up new opportunities to improve the quality, accessibility and relevance of education in the digital age, while preparing future generations to face the challenges and opportunities of the future. However, it is important to always maintain a focus on the core purpose of education - the development of the whole person - and use technology as a tool to achieve this goal, not as an end in itself.

The Relationship between Innovation, Digitalisation and Global Competitiveness

The relationship between innovation, digitalisation and global competitiveness is closely intertwined and has a significant impact on the modern economic and business landscape. Innovation is a key driver in improving global competitiveness. In an increasingly competitive era, the ability to create new products, services or processes that are more efficient and effective is key to success (Velev et al., 2023). Innovation enables companies and countries to differentiate themselves from competitors, create added value, and respond quickly to changing market needs. In a global context, countries that encourage a culture of innovation tend to have more dynamic economies and are able to adapt to changing global trends (Nurdiana et al., 2023).

Digitalisation acts as a catalyst that accelerates and expands the scope of innovation. Digital technologies open up new opportunities for innovation in a wide range of sectors, from manufacturing to services. For example, the Internet of Things

(IoT), artificial intelligence (AI) and big data analytics enable the creation of smarter and more personalised products and services (Ferraz et al., 2024). Digitalisation also enables new business models that were not possible before, such as the sharing economy and digital platforms. As such, digitalisation not only improves the efficiency of existing processes but also opens up space for radical innovations that can transform industries as a whole.

When innovation and digitalisation work together, they create a significant multiplier effect on global competitiveness. Companies and countries that successfully combine the power of innovation with digital capabilities can achieve drastic productivity gains, expand their market reach globally, and respond more quickly to market changes (Boboshko, 2020). For example, smart manufacturing, which combines innovation in production processes with digital technologies such as AI and robotics, enables more flexible, efficient and high-quality production. This in turn increases competitiveness in the global market.

While innovation and digitalisation offer great opportunities to improve global competitiveness, they also bring challenges. The digital divide between countries and between segments of society can widen global economic inequality. Countries and companies that cannot keep up with the pace of innovation and digitalisation risk falling behind in global competition (Tsybenko et al., 2023). Therefore, investments in education, digital infrastructure, and policies that support innovation are crucial. On the other hand, globalisation driven by digitalisation also opens up opportunities for developing countries and small firms to compete in global markets through digital platforms and the knowledge-based economy. Thus, the ability to harness the synergies between innovation and digitalisation becomes a decisive factor in improving and maintaining global competitiveness in the digital age.

The Impact of Innovation and Digitalisation on Global Competitiveness

Innovation and digitalisation have transformed the way companies and countries operate, dramatically increasing efficiency and productivity. Business process automation, the use of artificial intelligence (AI), and big data analytics enable organisations to optimise their operations, reduce costs, and increase output (Antonova, 2022). For example, in the manufacturing sector, the use of robotics and the Internet of Things (IoT) has resulted in smart factories that can operate 24/7 with a high degree of precision and consistency. This increased efficiency allows companies and countries to produce high-quality products and services at a lower cost, increasing their competitiveness in the global market (Shandilya & Srivastava, 2021).

Innovation and digitalisation have enabled the emergence of new business models that disrupt traditional industries and create new markets. Digital platforms such as Uber, Airbnb, and Amazon have changed the competitive landscape in transport, accommodation, and retail. The sharing economy and gig economy powered

by digital technologies have created new ways of providing services and organising labour (Ahmad & Khalid, 2024). Countries and companies that can capitalise on these opportunities and adapt quickly to changing business models have a significant competitive advantage in the global marketplace.

Digitalisation has accelerated innovation cycles and reduced the time it takes to bring new products to market (time-to-market). Technologies such as computer-aided design (CAD), 3D printing and digital simulation enable faster and more efficient product development processes. In addition, digital collaboration platforms allow geographically dispersed teams to work together in real-time, accelerating the innovation process. The ability to innovate quickly and respond to changing market needs with new products is becoming a critical competitive advantage in a dynamic global economy (Lingur & Yesina, 2024).

Innovation and digitalisation have removed many traditional barriers to entering the global market. E-commerce platforms and digital marketplaces enable even small and medium-sized enterprises (SMEs) to reach customers worldwide. Cloud computing and Software as a Service (SaaS) technologies have lowered the cost of IT infrastructure, allowing companies from developing countries to compete with large companies from developed countries (Dabbous et al., 2024). However, globalisation accelerated by digitalisation has also increased the intensity of global competition. Companies and countries that cannot adopt digital technologies and innovate quickly risk being left behind. Therefore, the ability to harness innovation and digitalisation becomes a key factor in maintaining and enhancing competitiveness in the era of the global digital economy (Samorodova, 2022).

Strategies for Increasing Innovation and Digitalisation in Education

The first step in enhancing innovation and digitalisation in education is to build a strong and equitable digital infrastructure. This includes providing high-speed internet access across educational institutions, including in remote areas. In addition, investment in hardware such as computers, tablets and multimedia equipment in the classroom is required (Tuijl et al., 2024). The development of integrated digital learning platforms is also essential, enabling students and teachers to access learning materials, collaborate and track progress online. This infrastructure provides the foundation for technology-based educational innovation and ensures that all learners have equal access to digital resources (Andronic, 2024).

Teachers and lecturers play a key role in implementing education innovation and digitalisation. Therefore, a comprehensive training and professional development programme is needed to improve educators' digital competencies. This training should include not only technical skills in using digital tools, but also digital pedagogics - how to effectively integrate technology into the learning process (Muharrom et al., 2023); (Nurhayati et al., 2023). Educators need to be equipped with the ability to design

innovative learning experiences, use technology-based assessment methods, and facilitate online collaborative learning. The establishment of communities of practice among educators can also encourage the exchange of ideas and best practices in digital education innovation.

Education innovation and digitalisation require fundamental changes in curriculum and learning methods. Curricula need to be redesigned to incorporate digital skills and 21st century competencies such as critical thinking, creativity and complex problem-solving. Learning methods need to shift from traditional knowledge transmission models to more interactive and student-centred approaches, leveraging technology to support active learning, personalisation and collaboration (Rhena et al., 2024). This could involve the use of blended learning, flipped classrooms, project-based learning, and virtual/augmented reality to enhance the learning experience. Flexibility in assessment and recognition of learning is also important, including the integration of micro-credentials and digital badges to recognise skills and competencies acquired through various learning pathways (Setoningsih, 2023).

Enhancing innovation and digitalisation of education requires extensive collaboration between various stakeholders. Educational institutions need to build partnerships with technology industries, edtech startups and research institutions to accelerate innovation. The creation of innovation hubs and incubators in educational institutions can encourage the development of localised edtech solutions that suit specific needs. International co-operation and exchange of best practices are also important to accelerate the adoption of educational innovations (Andreozzi et al., 2021). In addition, supportive policies from the government are needed, including incentives for education innovation, flexible regulations to allow experimentation, and funding support for education digitalisation initiatives. By building a strong innovation ecosystem, the education sector can continue to adapt and evolve to face future challenges (OKEZUE & C, 2022).

With the increasing use of digital technologies in education, data security and privacy are of paramount importance. Educational institutions must develop strict policies and protocols to protect student and staff data. This includes the implementation of robust cybersecurity systems, training on data security for all users, and compliance with data protection regulations. Transparency in data use is also important to build trust among all stakeholders (Sambiono & Setiyono, 2024).

Education innovation and digitisation should ensure that no learner is left behind. This means designing technology solutions and digital content that are accessible to all, including learners with disabilities or those from disadvantaged socio-economic backgrounds. Technology assistance programmes, such as the provision of devices and subsidised internet connections, can help bridge the digital divide. Universal design for learning should be implemented to ensure that digital learning materials and methods are accessible and useful for all learners (Tsybenko et al., 2023).

With that said, education innovation and digitalisation is a transformative journey that requires a holistic and collaborative approach. A comprehensive strategy, from infrastructure development to curriculum redesign, educator competency enhancement and innovation ecosystem building, is critical to the success of this transformation. Data security and inclusion should also be top priorities to ensure that digitalisation brings benefits to all learners without compromising privacy or increasing existing disparities (Zaragoza-Sáez et al., 2024).

The implementation of these strategies will enable the education sector to harness the full potential of digital technologies, creating learning experiences that are more dynamic, personalised and relevant to 21st century needs. However, it is important to remember that technology is not an end in itself, but rather a tool to improve the quality of education. The main focus should remain on learning outcomes, critical skills development, and preparing learners for success in a changing world (Larionova et al., 2021); (Sarmila et al., 2023); (Haddar et al., 2023).

With a balanced approach between technological innovation and sound pedagogical principles, digitalisation of education can open up new opportunities for lifelong learning, increase access to quality education, and better prepare future generations to face global challenges. Digital transformation in education is not just about adopting new technologies, but also about changing the mindset and culture of learning to create a more adaptive, inclusive and future-oriented education system.

Conclusion

Innovation and digitalisation of education has become a key factor in enhancing global competitiveness in this modern era. Digital transformation in the education sector is not only about adopting the latest technologies, but also about revolutionising the way we learn, teach and prepare future generations to face increasingly complex global challenges. Through smart technology integration, adaptive curriculum development, and enhanced digital competencies of educators, education systems can create learning environments that are more dynamic, personalised, and relevant to the needs of the global market.

However, the success of education innovation and digitalisation relies on a holistic approach that considers not only technological aspects, but also factors such as accessibility, data security and inclusion. With a focus on quality learning outcomes and critical skills development, digitisation of education can open up new opportunities for lifelong learning and improve access to quality education globally. Ultimately, effective innovation and digitisation in education will enable a country to better prepare its human capital, increase productivity and strengthen its position in global economic competition.

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