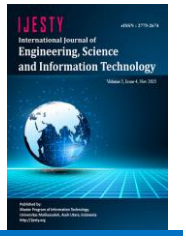
International Journal of Engineering, Science and Information Technology
Volume 5, No. 4 (2025) pp. 1-8
eISSN: 2775-2674
Website: http://ijesty.org/index.php/ijesty
DOI: https://doi.org/10.52088/ijesty.v5i4.917
**Research Paper, Short Communication, Review, Technical Paper**



# Information Technology Challenges: Developments and Potential Impact on Socio Economics in the Next Two Decades

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*The manuscript was received on 10 February 2025, revised on 20 April 2025, and accepted on 11 August 2025, date of publication 1 November 2025*

**Abstract**

This study aims to analyze the challenges, developments, and potential impacts of information technology (IT) on socio-economic aspects in the next two decades. Using the Systematic Literature Review (SLR) method that follows PRISMA guidelines, this study examines scientific articles from the Scopus database over the past two decades. The results of the study show that technological developments such as artificial intelligence (AI), big data, Internet of Things (IoT), and digitalization have brought significant changes in various sectors, increasing efficiency, productivity, and innovation. Projections for the next two decades indicate that this trend will continue and evolve, with a major impact on the job market, productivity, quality of life, privacy, and social interaction. The study's conclusions emphasize the need to invest in education and skills training to cope with job market changes, as well as the implementation of strict regulations to protect data privacy and security. Research recommendations include increased collaboration between the public and private sectors, equitable development of digital infrastructure, and public education on the healthy use of technology. Thus, this study provides comprehensive insights to optimize the benefits of information technology while anticipating and overcoming its negative impacts.

***Keywords***: *Future Trend Research, Impact of Information Technology, Research Gaps, Methodologies, Interdisciplinary Approaches.*

## 1. Introduction

The development of information technology (IT) has been one of the main drivers of significant changes in various aspects of human life over the past two decades. From digital transformation in the business sector to the adoption of technology in everyday life, IT has transformed the way we work, communicate, and interact with the environment around us [1]. Technologies such as artificial intelligence (AI), Internet of Things (IoT), big data, and blockchain have opened up new opportunities as well as complex challenges [2][3]. The importance of understanding these developments lies not only in their technological innovations, but also in their widespread social and economic impact [4]. Therefore, in-depth research on IT developments and their socio-economic impact in the next two decades is essential to help society, government, and businesses adapt and take advantage of the opportunities that exist [5].

Previous research has shown that IT has a huge influence on various sectors, from economic to social. For example, a study by Wang and Wang (2023) shows that the adoption of AI in the manufacturing sector can increase productivity by up to 30% [6], while research by Damioli, Van Roy, and Vértesy (2021) found that the use of big data in market analysis can increase the accuracy of economic predictions by 20% [7]. In addition, the implementation of IoT in smart city management has been shown to improve resource use efficiency and citizens' quality of life, as reported by Liu, Wan, and Yu (2023) [8]. Although many studies have explored the impact of IT in specific contexts, there is still a gap in the literature on how overall IT developments will affect socio-economic aspects in the long term, particularly in developing countries.

This research contributes to the existing literature by conducting a comprehensive review of the latest IT developments and analyzing their potential impact on socio-economic aspects in the next two decades. Using the Systematic Literature Review (SLR) method that follows the PRISMA guidelines, this study combines findings from various relevant studies to provide a more holistic and in-depth picture. Unlike previous research that has often been limited to one specific aspect or sector, this research covers a wide range of key technologies such as AI, IoT, big data, and blockchain, and highlights the linkages between the development of these technologies and

their impact on society and the economy. As such, the research not only fills in the gaps in the literature, but also offers new insights that policymakers, researchers, and practitioners can use to anticipate and manage future IT impacts.

This research aims to answer some key questions related to IT development and its impact on socio-economy in the next two decades: (1) What are the key trends in the development of information technology in the last two decades? (2) How is information technology expected to evolve in the next two decades? (3) What is the potential impact of information technology developments on socio-economic aspects in the future? (4) What are the recommendations that can be given to anticipate and mitigate the negative impact of information technology? To answer these questions, this study will use the Systematic Literature Review (SLR) method which refers to the PRISMA guidelines, which involves the identification, selection, and systematic synthesis of relevant studies. Potential contributions from this research include providing in-depth insights into information technology trends and impacts, identifying gaps in the current literature, and drafting policy recommendations and strategies to optimize the benefits of IT and reduce its negative impact on society and the economy.

## 2. Literature Review

Information Technology (IT) encompasses a wide range of technologies used to manage and process information. IT involves hardware, software, and communication networks that enable the collection, storage, processing, and distribution of information. This concept includes technologies such as computers, mobile devices, networks, as well as various applications and systems used to facilitate communication and information management within organizations [9]. According to research, IT has become the backbone of modern business operations, enabling efficiency, productivity, and innovation [10]. The importance of IT continues to increase along with the development of new technologies such as cloud computing and edge computing that provide flexibility and scalability for organizations [11].

Artificial Intelligence (AI) and the Internet of Things (IoT) are two key concepts in IT development that have great potential to transform various sectors. AI refers to the ability of machines to mimic human intelligence, including learning, thinking, and making decisions. AI has been used in a wide range of applications from industrial automation to customer service personalization [12]. Meanwhile, IoT refers to a network of devices that are connected and capable of communicating with each other over the internet, enabling real-time data collection and analysis [13]. The merger of AI and IoT creates intelligent systems that can improve operational efficiency and provide deeper insights for decision-making [14].

Big Data and Blockchain are other important concepts in the IT landscape. Big Data refers to large volumes of data that cannot be managed with traditional data processing techniques. This data is varied, comes quickly (velocity), and in very large quantities (volume). Big data analytics allows organizations to identify trends, make predictions, and make data-driven decisions [15]. Blockchain, on the other hand, is a distributed ledger technology that records transactions securely and transparently. Blockchain is used in various applications such as cryptocurrencies, decentralized financial systems, and supply chain management. Blockchain promises increased security, transparency, and efficiency in digital transactions [17].

Recent research has highlighted various important aspects of the application of information technology in various sectors. For example, a study by Wang and Alexander (2015) examined how big data is being used in the healthcare sector to improve clinical outcomes. They found that big data analysis allows for more accurate identification of disease patterns and predictions of health risks, thereby improving the quality of patient care [18]. In the manufacturing sector, a study by Raja et al. (2022) shows that the application of AI and IoT can improve operational efficiency and reduce production costs by automating processes and performing predictive maintenance [12]. This research shows the great potential of IT in improving the efficiency and effectiveness of various industrial sectors.

In addition, research by Kravchenko (2019) highlights the role of IoT in the development of smart cities. They found that IoT allows for more efficient management of city resources, such as energy, water, and waste management, as well as improving the safety and quality of life of citizens. The study shows that the application of IoT technology can bring about significant changes in the way cities are managed and operated [19]. Similarly, research by Latif et al. (2023) found that big data analytics can be used to improve the accuracy of economic predictions, which helps governments and companies make better and faster decisions [15].

However, not all studies show the positive impact of IT implementation. Research by Dilmaghani et al. (2019) highlights the security and privacy risks associated with the use of big data and AI. They found that an increasing amount of data collected and analyzed can increase the risk of privacy breaches and cyberattacks [20]. Additionally, research by Bharathi (2017) suggests that the adoption of new technologies such as blockchain can pose regulatory and compliance challenges, as these technologies often go beyond existing regulatory frameworks [21]. This research emphasizes the importance of developing policies and regulations that can keep pace with technological developments.

Furthermore, research by Bala and Venkatesh (2015) criticizes the implementation of IT technology in organizations that often do not pay attention to the human aspect. They found that while technology can improve efficiency, lack of training and adaptation by employees can lead to resistance and reduce the effectiveness of the technology. This research emphasizes the importance of paying attention to the human aspect in the implementation of technology, including adequate training and change management [22]. In addition, research by Huda et al. (2017) shows that the adoption of new technologies such as blockchain and AI has great potential, but the adoption of these technologies is still limited by high costs and complexity of implementation [23].

Based on the literature that has been reviewed, it is clear that information technology has a significant impact on various sectors. However, there is a striking gap in the literature regarding long-term analysis of how these developments will affect socio-economic aspects, particularly in developing countries. This research will fill this gap by developing a framework that integrates the findings from the various studies discussed earlier. The framework will include in-depth analysis of AI, IoT, big data, and blockchain, as well as their impact on operational efficiency, decision-making, security, privacy, and regulation.

This research will continue previous studies with a more holistic and longitudinal approach, exploring how information technology develops and affects socio-economics in the next two decades. By using the Systematic Literature Review (SLR) method and following the PRISMA guidelines [24], this study will identify, evaluate, and synthesize findings from various sources to provide a comprehensive picture. This research will not only fill in the gaps in the literature, but also provide practical recommendations for policymakers, researchers, and practitioners to manage and optimize the impact of information technology.

## 3. Method

This study aims to examine a collection of scientific articles, discuss research trends related to "Impact" AND "information technology" AND "The Future", which have been published in reputable international journals with the Scopus index. Scopus is one of the most extensive and comprehensive sources of citations and has an abstract database of peer-reviewed literature, such as scientific articles, books, and conference proceedings [25]. In addition, the review article in this study is also intended to conceptualize the study of "Impact" AND "information technology" AND "The Future", through research questions (1) What are the main trends in the development of information technology in the last two decades? (2) How is information technology expected to evolve in the next two decades? (3) What is the potential impact of information technology developments on socio-economic aspects in the future? (4) What recommendations can be given to anticipate and mitigate the negative impact of information technology? These research questions will be explained through data findings and discussions of data processing results carried out using VOSviewer software.

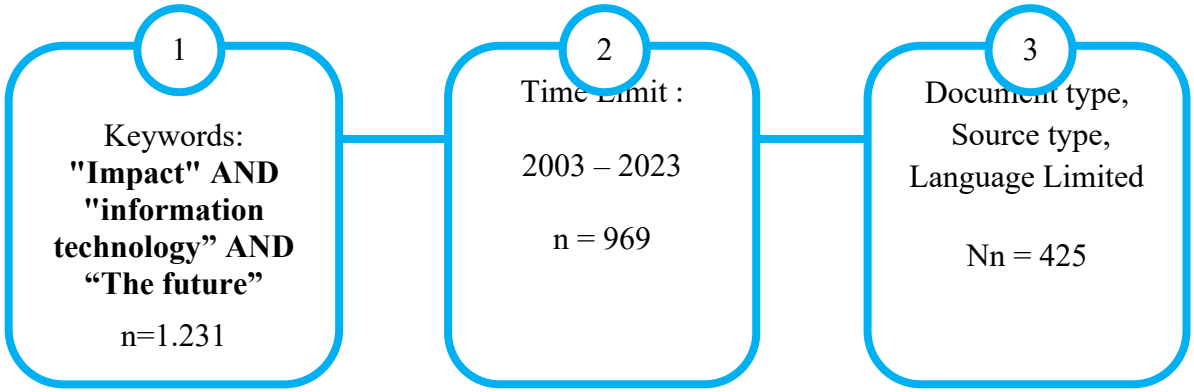


**Fig 1.** Data Filtering Step. Source: Created by the Author

Furthermore, the research data was taken on the Scopus database which was carried out through several stages as shown in Figure 1. In the first stage, researchers categorized searches using two keywords, "Impact" AND "information technology" AND "The Future", which were identified based on category titles, abstracts, or keywords, resulting in 1,231 documents. In the second stage, the researchers limited the time by modifying the database search to 20 years from 2003 to 2023. At this stage, 969 documents were produced. Then in the third stage, the author determines the focus of the type of document to be analyzed, namely the type of article, which then produces 437 documents. Furthermore, the author limited the source type to only come from journals, resulting in as many as 425 documents. So as many as 425 final documents obtained will then be analyzed.

## 4. Result And Discussion

### 4.1. Major Trends in Information Technology Development in the Last Two Decades

Using the PRISMA method and conducting a search process for a number of articles from the Scopus database, 425 documents related to the search keywords "Impact" AND "information technology" AND "The Future" were found. Searches with these keywords are expected to be able to reveal the impact of the use of information technology on various aspects and see future research opportunities related to information technology, especially in socio-economic aspects.

Furthermore, the database of the 425 documents was analyzed using the VosViewer application on the create a map based on bibliographic data menu with the type of analysis Co-occurrence and keywords as the unit of analysis. Network visualization data shows the results of clusters obtained as many as 5 clusters, a total of 196 items, a total link strength of 5622, as shown in figure 2.

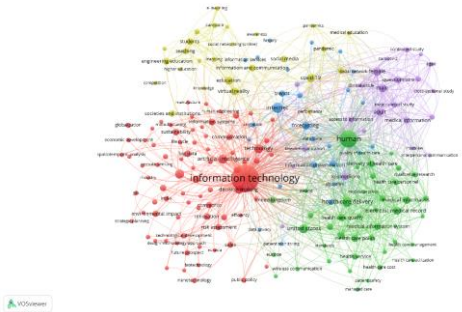


**Fig 2.** Network Visualization

Figure 2 generated from VOSviewer data shows five main clusters, each of which consists of various topics in the development of information technology. With a total of 196 items, here is the distribution and analysis of each cluster:

1. Cluster 1 (Red) is the largest cluster with 79 items, focusing on key topics such as Information Technology, Artificial Intelligence, Big Data, Decision Making, Digitalization, and Efficiency. This cluster covers topics related to how information technology is used to improve operational efficiency and data-driven decision-making [26][27][28]. Other topics included are Information Systems, Internet of Things, Software, and Technology Adoption. The interconnectedness between topics in this cluster shows that AI and big data play a central role in facilitating digital transformation and technology adoption[29][30].
2. Cluster 2 (Green) consists of 42 items and focuses on Human, Healthcare, Medical Informatics, Health Service, and Public Health. These topics demonstrate how information technology is being used to improve healthcare and medical information management [31][32]. Topics such as Managed Care highlight the importance of technology in managing and improving healthcare efficiency. The interconnectedness of topics in this cluster reflects the interaction between various aspects of human health and information technology.
3. Cluster 3 (Blue) with 26 items covers the topics of Internet, Trends, Social Network, and Data Privacy. This cluster illustrates how internet and social media technologies are evolving and affecting data privacy [33][34]. The relationships between topics in this cluster show that trends and innovations in internet technology are strongly related to data privacy and security issues [35].
4. Cluster 4 (Yellow) also has 26 items, focusing on Virtual Reality, Education, E-Learning, and Engineering Education [36] [38]. Topics such as Learning System, Social Media, and Teaching highlight how information technology is used to support education and learning [39]. The interconnectedness between topics in this cluster shows that educational technologies such as VR and e-learning are increasingly integrated with conventional learning systems.
5. Cluster 5 (Purple) has 23 items, with the main topics Adult, Medical Information, Female, Male, and Telecommunication. These topics highlight the demographic and social aspects of the use of information technology [40][41][42]. The interconnectedness between topics in this cluster shows the interaction between the use of information technology and demographic characteristics.

In technology development, topics such as artificial intelligence, big data, Internet of Things (IoT), and digitalization play a key role in profound digital transformation and have a significant impact on operational efficiency, productivity, and business innovation [43]. The adoption of technologies such as IoT continues to grow and be applied in various sectors, demonstrating how information technology is changing the way we work and live [44]. In addition, topics such as data privacy and social networks are very relevant to the challenges of privacy and information security in the digital age [45]. Overall, the interconnectedness of these topics reflects how information technology is evolving and affecting socio-economic aspects in the next two decades.

The main ren in the development of information technology in the past two decades shows rapid progress and widespread adoption in various fields. First, artificial intelligence and machine learning have become central to innovation, with widespread applications ranging from industrial automation to intelligent consumer service [46]. Second, big data has revolutionized the way organizations collect, analyze, and utilize data for more informed and efficient decision-making [47]. Third, the Internet of Things (IoT) has connected various devices through the internet, creating networks that support smart cities, smart homes, and industry 4.0 [48]. Fourth, digitalization has driven digital transformation in various sectors, from business to education, transforming traditional processes to be more efficient and digitally integrated [49]. In addition, data privacy and information security have become a major focus as concerns about personal data protection rise amid the widespread use of social networks and digital applications [50]. This trend shows that information technology is not only technologically developed but also has a significant impact on the global social and economic structure [51].

## 4.2. Information Technology Development in the Next Two Decades

The development of information technology in the next two decades can be analyzed through the results of overlay visualization using the VOSviewer application. This overlay visualization was chosen because it provides better validation to verify the latest trends in academia, by classifying items based on timescales. The items are given different colors based on the year of publication, thus helping to confirm the promising direction of future research [52].

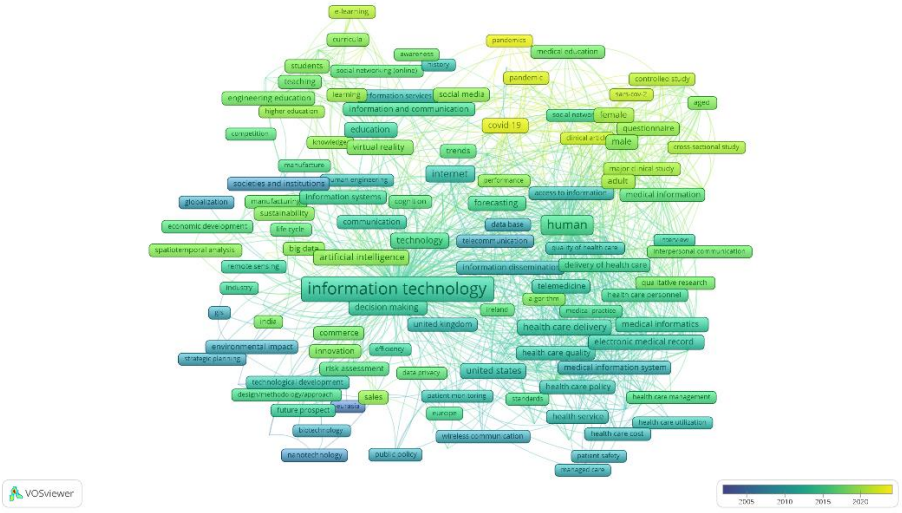


**Fig 3.** Overlay Visualization

Based on image 3 overlay visualization from VOSviewer, we can see how the main topics in information technology have evolved from 2005 to 2020. Darker colors indicate earlier research, while lighter colors indicate more recent research. From this visualization, we can

identify patterns and trends in the development of information technology, as well as project how these trends will continue in the next two decades. By understanding existing developments, we can anticipate challenges and opportunities that may arise, as well as prepare strategies to optimize the positive impact of information technology on socio-economic aspects [52][53].

Based on the trends of the last two decades seen in Figure 2, the researcher projects several key trends in the development of information technology in the next two decades. First, artificial intelligence and machine learning will continue to be central to technological innovation, with wider applications in sectors such as healthcare, education, manufacturing, and public services. Increasing AI capabilities in predictive analytics and automation will continue to drive efficiency and innovation [54], [55].

Second, the Internet of Things (IoT) will evolve further with deeper integration into daily life and business operations. The increase in the number of connected devices creates a smarter and more responsive ecosystem that supports the concepts of smart cities, smart homes, and industry 4.0. This will bring significant changes in resource management and operations, as well as an improvement in the quality of life [56], [57].

Third, digitalization will be more profound, with digital transformation covering almost all aspects of life and business. Organizations will continue to adopt digital technologies to optimize their processes, improve customer interactions, and create new value. This will be supported by improved digital infrastructure, including developments in 5G networks and blockchain technology [58], [59].

Fourth, the issue of data privacy and information security will become increasingly important as the volume and sensitivity of data collected and analyzed increases. Stricter regulations and more advanced security technologies will be needed to protect individual privacy and information security. Topics such as data privacy and data security will continue to be the main focus of technology research and policy [60], [61].

Fifth, in the health sector, the application of information technology will continue to develop with telemedicine and medical information systems that are increasingly sophisticated. This will improve access to health services and quality of care, especially in remote areas. Technologies such as big data and AI will be used for deeper analysis of medical data, supporting more accurate diagnoses and more personalized treatments [62], [63].

## 4.3. Potential Impact of Information Technology Development on Socio-Economic Aspects in the Future

Based on cluster analysis and discussion of key trends in the last two decades, we can project some potential impacts of information technology developments on socio-economic aspects in the future. Information technology, with innovations such as artificial intelligence (AI), Internet of Things (IoT), and big data, will continue to play a crucial role in economic and social transformation.

AI and automation will continue to replace manual and routine work, which could lead to job cuts in some sectors. However, this technology will also create new jobs that require special skills in the management and development of information technology. Therefore, retraining and upskilling the workforce will be crucial to keep pace with these changes and ensure the workforce can adapt to the evolving needs of the industry [64], [65]. The implementation of AI and big data allows organizations to optimize their business processes, increase efficiency, and reduce operational costs [66]. Additionally, IoT will enable more effective monitoring and management of assets, creating a more efficient and responsive work environment [67]. This digital transformation will drive economic growth and increase global competitiveness [68].

In the health sector, technologies such as telemedicine and medical information systems will improve access to health services, especially in remote areas. Research shows that telemedicine can reduce unplanned hospitalizations, lower healthcare costs, and improve patient family satisfaction [69]. With big data analytics, healthcare can be more personalized and predictive, improving health outcomes for individuals [70]. In the field of education, technologies such as e-learning and virtual reality will enable wider access to quality education, reduce educational disparities, and facilitate lifelong learning [62].

As the amount of data collected and analyzed increases, with the increasing reliance on information technology, cybersecurity risks also increase. Therefore, stricter policies and more advanced security technologies are needed to protect personal data and ensure user privacy. Proper regulation and standards will be key in managing these risks and building public confidence in the technology [71], [72].

The impact on social interaction and social networks also needs to be considered. Social media and digital platforms have changed the way people interact and communicate. While these technologies allow for greater connectivity and wider access to information, they also bring challenges such as the spread of misinformation and negative impacts on mental health. Therefore, a balanced approach is needed to harness the benefits of this technology while managing its negative impacts [73].

Overall, the development of information technology will have a broad and profound impact on various socio-economic aspects. To maximize benefits and reduce risks, there needs to be an integrated approach between technological innovation, public policy, and education. Thus, people can be better prepared to face changes and utilize information technology to create a better future. The following are recommendations that can be given to anticipate and mitigate the negative impact of information technology.

**Table 1.** Recommendations to mitigate the negative impact of information technology

| Number | Socio-Economic Aspects | Recommendations | Explanation |
|---|---|---|---|
| 1. | Job Market and Employment | Investments in education and skills training | Provide retraining and upskilling programs for workers impacted by automation and AI. |
| 2. | Productivity and Efficiency | Increased collaboration between the public and private sectors | Encourage joint innovation between government, industry, and academia for efficient and effective solutions. |
| 3. | Quality of Life and Access to Services | Development of digital infrastructure | Ensure equitable access to information technology in remote and underdeveloped areas. |
| 4. | Privacy and Information Security | Implementation of strict privacy regulations and security standards | Protect personal data and sensitive information through clear regulations and the implementation of high security standards. |
| 5. | Social Interaction and Networking | Increased awareness and education about the healthy use of technology | Educating the public about the negative impact of social media and how to use technology in a healthy way. |

By applying the recommendations in table 1, we can anticipate and mitigate the negative impact of information technology developments, while maximizing the benefits offered by technological innovations. An integrated and collaborative approach between government, the private sector, and society will be key in creating an environment conducive to sustainable and inclusive technological growth. Proper planning and adaptive policies will ensure that information technology can be used to improve overall social and economic well-being, so that we can take advantage of the opportunities offered by information technology while addressing emerging challenges.

## 5. Conclusion

An analysis of information technology (IT) developments and their potential impact on socio-economic aspects in the next two decades provides clear insights into the key trends and challenges faced. First, the study identifies key trends in IT developments over the past two decades, highlighting significant advances in artificial intelligence (AI), big data, the Internet of Things (IoT), and digitalization. These technologies have revolutionized various sectors by increasing efficiency, productivity, and innovation. For example, AI has played a crucial role in automating processes and improving decision-making, while IoT has connected various devices, enabling real-time data collection and management. The widespread adoption of these technologies underscores their crucial role in transforming business operations and daily life.

Second, the projection of IT developments for the next two decades shows that these trends will continue to evolve and expand. AI and machine learning are expected to become increasingly integrated across sectors, driving further innovation in healthcare, education, manufacturing, and public services. IoT will be increasingly integrated into daily life and business operations, creating a smarter and more responsive environment. The digitization of processes will continue to deepen, improve customer interaction and create new value, supported by improvements in digital infrastructure such as 5G networks and blockchain technology. These developments point to a future where technology continues to drive efficiency and create new opportunities in various sectors.

Third, the potential impact of this technological advancement on socio-economic aspects is enormous. On the positive side, technologies such as telemedicine and e-learning will improve access to health services and education, especially in underserved areas, thereby reducing disparities and improving the quality of life. However, challenges such as reduced work due to automation and concerns about data privacy and security need to be addressed. Investments in education and skills training are essential to help workers adapt to new job needs, and strict regulations are needed to protect personal data and ensure cybersecurity. By understanding these trends and preparing the right measures, policymakers, researchers, and industry leaders can maximize the benefits of IT developments while mitigating their negative impacts, ensuring a balanced and inclusive technology future.

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