Chapter 8
Sustainable Goal Achievement by Digital Revolution During and After Pandemic; How Much One Wins and Losses: A Bird's Eye View for Future Planning

Pham Tien-Dung, Xuan-Doa Nguyen, and Subhankar Das

Introduction

The digital revolution, which includes virtual reality, 3D printing, and artificial intelligence, has entered the public discourse in many countries (Adner, 2016). The digital revolution is becoming a key driver of society's transformation. Its potential to transform society must be considered along with the various goals and initiatives of the 2030 Agenda (Amit & Zott, 2015). The digital revolution will transform society's operation and how it thinks about sustainability. It is also a driver of disruptive change.

The digital revolution is the key enabler of sustainable development. However, it can create many negative externalities (Anjum et al., 2017). The digital process is a powerful force that can propel change through its transformative capabilities. At the same time, it can also carry solid social disruptive power if handled with caution and innovation (Benner & Tripsas, 2010). The report highlights the various benefits of the digital revolution and its potential negative impacts. It also warns about the challenges of addressing the digital divide, which excludes many people currently living in poverty (Besharov & Smith, 2014). The chapter also outlines the various conditions that a successful digital transformation needs to be successful. It also talks about the social implications of the digital revolution and the related governance considerations. Humanity's dilemma is to live within a safe and just Earth system.

P. Tien-Dung · S. Das (✉)
Institute of Development Economics Research, University of Economics, Ho Chi Minh City, Viet Nam
e-mail: subhankardas@idr.edu.vn

P. Tien-Dung
e-mail: dungpt@ueh.edu.vn

X.-D. Nguyen
Ho Chi Minh City Institute for Development Studies, Ho Chi Minh City Government, Ho Chi Minh City, Viet Nam

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A growing list of global risks threatens our planet's stability. While preserving the planet's resiliency depends on optimizing socioeconomic development, it also requires improving human welfare.

In 2015, the world's prominent organizations adopted the 2030 Agenda for sustainable development. The 2030 Agenda is a far-reaching and time-bound plan that aims to achieve ambitious goals (Candau & Gbandi, 2019). It was developed through a comprehensive consultation among civil society and national governments. It includes a set of goals and targets that can be achieved by 2030. It also has plans for social and economic development. The rise of the digital revolution, which includes artificial intelligence (A.I.), virtual reality, and additive manufacturing, has been widely debated.

The digital transformation will have a transformative effect on society and economies. It will also change the way we view and act on sustainable development. Below are some of the critical considerations that should be considered when exploring the potential of the digital revolution for sustainable development. Digitalization aspects are discussed in the following elements (Chellappa & Mukherjee, 2021). Figure 8.1 represents the six aspects of digital revolution.

A. ***Digitalization & Society:*** The digital revolution, which started in the 1950s, is a third civilizational revolution accelerating. It marks the emergence of new technical systems that can enhance human cognition. In 2019, real numbers were spontaneously generated in a deep neural network trained to recognize visual objects. The performance revealed the characteristics of the animal and human number discriminations. Digital Anthropocene is a newly configured context that needs to be rethought and developed to address the various challenges and opportunities that it presents (Cropanzano et al., 2017). Digital technologies

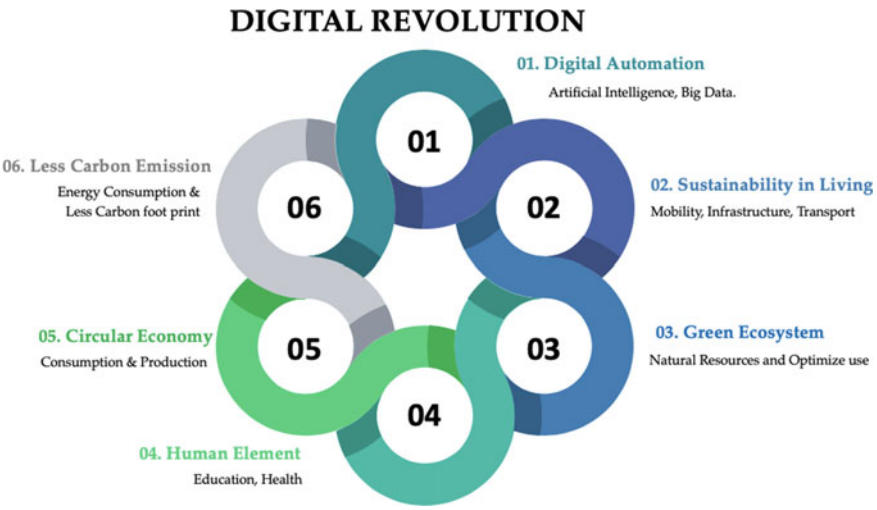

Fig. 8.1 Different aspects of digital revolution (*Source* Authors' conception)

can help us achieve a Sustainable Anthropocene by accelerating the decarbonization of all sectors and by contributing to a reduction of greenhouse gas emissions. This report and many others show that digital platforms can help achieve these goals. Although digital media can help accelerate the decarbonization of various sectors, this transition will not be an automatic process (Foss & Saebi, 2016). Technological revolutions have led to resource and greenhouse-gas-intensive growth patterns for many years. To avoid disrupting the current trends, a radical reversal of these trends is needed to create pathways toward sustainable development (Huang & Rust, 2018). The report identifies six fundamental transformations required to achieve the 17 Sustainable Development goals.

B. ***Digital automation for SDG:*** Digital technologies can help accelerate the decarbonization of the world, and they can also contribute to a more sustainable Anthropocene. According to the TWI2050 report, digital technologies can help accelerate the decarbonization of the world, and they can also contribute to a more sustainable environment (Joung et al., 2021). Although digital technology can help accelerate the decarbonization of the world, it will not be an automatic process. Until now, the transition to a more sustainable future has been primarily triggered by the effects of the previous industrial revolutions (Kaldeli et al., 2016). A radical change in current trends helps achieve the Sustainable Development goals (SDGs) and maintain a long-term sustainable future. The report TWI2050 identifies six fundamental transformations needed to reach the goals.

   The 2030 Agenda for Sustainable Development is a set of goals that should be regarded as mid-point indicators toward achieving sustainable development by 2050. There is an urgent need for policies and incentives to support this goal. The Six Essential Mechanisms can be linked to enable the Six Fundamental Challenges of Sustainable Development using digital technologies (Kim et al., 2014). These include mobilizing market forces and environmental policies that support sustainable development. Using digital technology to transform planning and markets processes for a sustainable future is an essential component of this strategy (Korkeamäki & Kohtamäki, 2020). It can help pave the way for more effective and efficient use of resources and better understanding goals and milestones for various sectors.

C. ***Effect on digitalization on society and sustainable development goals:*** The rapid emergence and evolution of digital technologies have raised the concerns of society's leaders. If not addressed properly, these changes could threaten community cohesion and undermine the 17 Sustainable Development Agenda. The four significant challenges facing humanity are inequality, education systems, labor market, and dissipative forces (Marinova et al., 2016). There is also a potential rise of political power due to the so-called Big Five companies (e.g., Amazon, Facebook, Google, and Microsoft). With the potential to improve governance and steering policies, digitalization could also help address the four slippery slopes.

D. ***Digital technology and effect on humans; Quantum leap beyond current trend:*** The next decade will see profound changes in society and economies because of digital transformation. It requires policymakers and organizations to step up their efforts to understand digital change's various effects and prepare for the inevitable structural changes (Ng & Vargo, 2018). With the rise of digital disruption, we are entering a new era of cultural and economic realities. We can now improve our cognitive capabilities to make informed decisions using artificial intelligence and virtual reality. The emergence of autonomous systems based on artificial intelligence will fundamentally transform society. By processing vast amounts of data, AI-based machines will change how we consume and work (Rust & Huang, 2014). They will also enable new treatments for diseases and provide personalized forecasts for individuals. The evolution of human intelligence has had no rival since humans first appeared. With the rise of artificial intelligence, it is now considered a primary task for humanity to meet sustainable development goals (Sick et al., 2019). There are many challenges in developing and governing sustainable pathways aligned with the profound societal transitions that are happening right now. How can our legal systems keep up with the rapid technological change brought about by the rise of virtual and self-learning environments? How can automation help people become more prosperous while leaving no one behind? What ethical guardrails should be placed in place when it comes to transforming humans and artificial intelligence? What role should human judgment play in the development of machine learning? Can we avoid making systems that can control human behavior? These questions are not part of the 2030 Agenda. They illustrate the complexity of the tasks that need to be done to build a sustainable global society. These tipping points are based on the various characteristics of our communities and consider the multiple configurations of society that will shape up over the next decade (Turber et al., 2014). Climate change and its impacts are triggering various tipping points on Earth's planetary boundaries due to the digital growth patterns not diverted toward sustainability (Urbinati et al., 2021). These points are also triggered by the erosion of civil society due to the increasing use of digital surveillance and authoritarian rule. Others are concerned about the uncontrolled human enhancement methods that will transform humanity.

E. ***Circular economy with human intervention and the digital revolution:*** The paradox of the digital Anthropocene is that although the digital process has created unprecedented opportunities for transformative change, it is also endangering the very foundations of sustainable development. The evolution of the circular economy is already within reach (Vargo & Lusch, 2017). It could allow us to decouple wealth creation from the consumption of resources. The fusion of knowledge breakthroughs and technological innovations can create new opportunities for humanity. This potential is evidenced by new biomimetics, synthetic biology, and composite materials. The digital dynamics could enable new cultural and institutional innovation (Westerlund et al., 2014). It could help build a global society based on shared values and create new common goods

perspectives. Virtual worlds could help people better understand cultural diversity. In parallel, digitalized voting procedures could help democratize democracy and improve local governance efficiency. The convergence of digital technologies and physical and cognitive capabilities will enhance human performance (Wirtz et al., 2010). Human life spans have increased dramatically due to the achievements of scientists and athletes in the field of knowledge and health. In the future, artificial organs and limbs will be developed, while the capabilities of humans with physical augmentation will also be enhanced. The rise of virtual reality and the fusion of various facts could result in losing privacy and control over one's personal data and personality. It could threaten the freedom of people in the future. The loss of control is considered one of the biggest threats to the human Anthropocene. Despite the hype about the potential of digital technology, machines controlling humans is a real danger. Despite the uncertainties of the future, the direction of change remains unknown.

Therefore, the importance of steering change must be the highest priority. The Digital Revolution presents a unique opportunity to build responsible knowledge societies that act toward sustainability (Xu et al., 2014). The potential risks posed by the various technologies and artificial intelligence that can be used in the digital era can be tackled if the two communities can come together. To achieve sustainable development, we will need to connect the tremendous potential of the twenty-first century's technological breakthroughs with the most challenging tasks. The current era of digitalization presents various challenges in addressing the multiple issues of the Digital Anthropocene. How can we interact with A.I., and how can we maintain democracy in the face of technological change? In times of digital disruption, authoritarian governments and powerful business actors pose significant threats to democracy and civil rights.

F. ***Societal challenges for the digital revolution*** Technology can face many societal challenges, such as increasing digitalization. However, it is also clear that the benefits of technology can be maximized for a sustainable future. The potential for significant progress in education, health, and wealth creation is undisputed. There are also societal impacts that will be brought about by our changes in how we live and work. With so many changes happening in society, governments and organizations are at a critical crossroads (Zott & Amit, 2010). The crucial question is whether these changes can be managed or regulated to be accommodated efficiently. Unfortunately, when introducing new technologies, most of the consequences are only acknowledged after the fact. The digital revolution can help inform the public about the many advantages of new technologies (Das & Mondal, 2016). However, it can also restrict their full potential due to public concerns. The following principles help create an interconnected system architecture that will support digital and sustainable transformation management.

   a. Education and science are the key factors that people need to understand and shape the digital shifts. Through education, people will shape the

future of digital transformation. Science will also play a crucial role in transforming knowledge networks.

b. Digitalized development needs to improve the capabilities of public institutions to manage and understand the digital world.
c. Experimental spaces are the key to cultivating a culture of learning and experimenting.
d. The Digital Revolution will have global impacts, such as the modernization of the U.N.
e. The 2030 Agenda can be seen as a new social contract that will guide how we think about the world beyond 2030. It will involve new development models focused on the environment and society.

The Six Transformations are actions that can help us achieve a better life for ourselves and our planet. They are linked to power dynamics that can affect the development of humans. The various processes that make up the Six Transformations are managed according to their evolution. If they are appropriately managed, they can serve as an entry point for achieving the goals of the SDGs.

Sustainable Development and Digitalization: Prerequisites

The Sustainable Development Goals are a set of goals that aim to improve the lives of all people on Earth. These goals are sometimes referred to as the triple bottom line. They are focused on human, environmental, and economic development. The 2030 Agenda emphasizes the importance of good governance. The 17 SDGs are universal and also referred to as holistic goals. They are designed to provide a globally agreed framework for achieving goals and management directions (Mondal et al., 2017). The U.N.'s Sustainable Development Goals are a unique concept that sets a new social contract for the world. They are designed to address the most critical issues of our times. Since human activity has already breached planetary safe spaces, all countries must now shoulder their responsibilities to achieve the goals of the Sustainable Development Agenda (Jain et al., 2018). Some prerequisites are needed for sustainable development, which are described as follows. Figure 8.2 represents all the prerequisites for sustainable development and digitalization.

a. ***Development mindset for sustainable growth***:

The Digital Revolution has the potential to improve the well-being of people globally. However, its potential to do so is overshadowed by the uncertainties associated with the nature and future of work. Despite the significant productivity growth that technology has provided, there is no guarantee that it will create more jobs (Mondal & Das, 2021). Understanding the economic conditions that left those without a college education is pressing for policymakers (Singh & Das, 2018). There is no immediate solution to the issue of productivity growth, which most countries are likely to face. We need to move away from a planned obsolescence model that involves the disposal

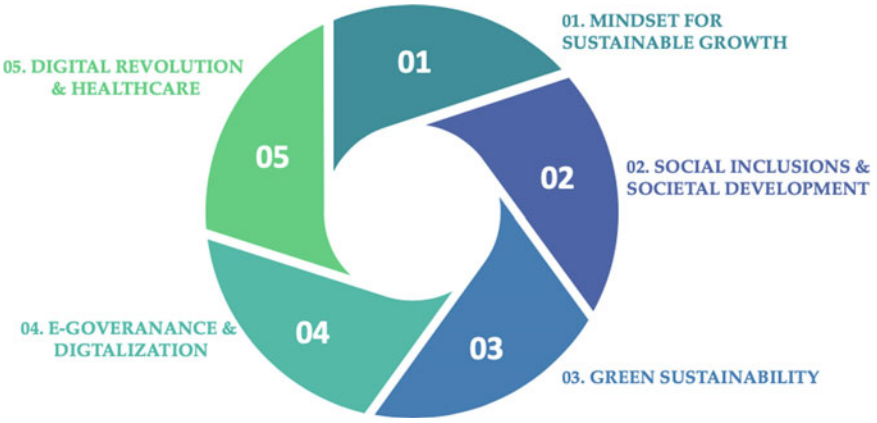

Fig. 8.2 Prerequisites for sustainable development and digitalization (*Source* Authors' conception)

of non-productive resources. Instead, it should be a circular economy that encourages the reuse of resources.

Unfortunately, despite the rapid emergence of digital technologies, most do not yet have the proper incentive to reuse finished products and materials. It is mainly due to the increasing number of features in devices. Due to the growing number of marketing campaigns, consumers are now buying replacement products that are often only as good as the new ones (Gupta et al., 2019). Although they may be obsolete, many new products still have the same functionality. In the U.K., it has been estimated that around four times as many mobile phones are still unused as those currently used. Over 30% of household appliances are still in working condition in Germany (Behera et al., 2019). The growth of green industries through the circular economy can help in an increasing number of jobs created by

b. ***Social inclusions and Societal development:***

Digital technologies have made their way across much of the world, but they also have characteristics that make them more prone to social inequality. Even more so, the digital divide shows that the various benefits of using digital technologies have fallen short of being inclusive. This divide is often relevant to different social groups and regions across the globe. Equalities are affected by various factors such as access to digital technologies, education, and affordability (Mohanty et al., 2019). They also impact the economy through job losses, technological breakthroughs, and increased productivity. The promise of digital inclusion is only realized if it reaches the currently left behind people.

There may be warning signs of the dangers of algorithms and their potential to leave people behind. Digitalization can help bridge the digital divide, but it can also cause more problems if not managed well. Most of the barriers to digital inclusion are related to access. For instance, around half of the world's population still lacks Internet access. This list does not consider the various factors that affect the quality of service, such as reliability and affordability (Nadanyiova & Das, 2020). Most of the

time, digital technologies are more prone to diffuse than some basic ones. Internet access can also bridge the divide between people living in different countries. A 2016 study by the World Bank showed that economic disparities remained large even across generations. Unfortunately, there are still barriers to accessing these resources, such as the lack of electricity and Internet costs. Open-source databases such as Wikipedia help ensure the spread of information globally. Due to the steady growth of Internet access and electricity, the proportion of people with Internet access is expected to reach almost full coverage by 2030 (Mondal, 2020b). Through social media, groups and movements can become mainstream. However, this platform can also reduce the diversity of perspectives, creating echo chambers. The development of echo chambers could disrupt a well-informed public debate. It could also lead to the rise of mental disorders (Das, 2020b). Internet access can help spread values and norms according to human rights principles. These can be spread through various means, such as social media and television, to enable people to make informed decisions about their bodies and sexual and reproductive health.

c. ***Green Sustainability:***

The Anthropocene is characterized by the rapid emergence of new technologies and their potential to improve society's well-being. However, achieving a sustainable future requires addressing the various factors that affect it, such as land use and climate change. Technology's increasing adoption has led to the depletion of Earth's natural resources and climate change. The increasing popularity of digital devices, especially smartphones, has raised concerns about their lack of Earth's resources (Sharma & Das, 2020). In addition, their use increases the amount of e-waste. The number of mobile devices has more than doubled in less than three decades, and this rapid increase in consumption places additional stress on the environment (Singh et al., 2020). A report released in 2018, for instance, indicated that the greenhouse gas emissions from digital technology will increase by around 2% in 2020 and 8% in 2025. A reduction in energy and carbon footprint can be achieved with new, highly efficient technologies. However, this trade-off can be appropriately managed (Siri et al., 2020). Unfortunately, the pace of the digital revolution has caused regulators to adopt policies that are often enacted after the fact. It leads to the development of too short regulations and tends to impose harsh conditions on the use of new technologies.

d. ***E-governance and digitalization boost for sustainability:***

Peace and good governance are critical to sustainable human development. The digital transformation can also shape the political actors' roles in shaping this ideal. The digital transformation presents new political and security challenges, such as the rise of cyberwars and drone wars. Although states and societies can now rely on digital tools to address these challenges, they still need to make the most of them. These reforms are still the same as those proposed in the TWI2050 framework. The digital transformation can also create new opportunities for governments and communities to work together to achieve the SDGs (Van et al., 2020). Getting the most out of the digital transformation involves ensuring that technology is not used in contested

governance spaces. It is because it can magnify existing inequalities. Despite the potential benefits of the digital economy, there are still many ways to use it for good. Strictly following the rules and regulations can still be very beneficial for humanity. One of these challenges is having someone with deep technical knowledge evaluate multiple platforms (Duy et al., 2020). After transitioning to a free and open-source platform, government agencies must rethink their procurement process. There are also opportunities for governments to implement flexible digital media.

e. ***Digital revolution and healthcare***

The use of technologies for healthcare has always been an essential part of the system. In particular, advancements in medical imaging have led to a reduction in invasive procedures (Mondal, 2021). Due to the rapid emergence of digital technology, healthcare has become more accessible and personal. For instance, ultrasound technology is now available via smartphones. Various new technologies such as virtual reality and mobile health have emerged in the past couple of years. With the rapid emergence and acceptance of fitness trackers, people can now monitor their health in real-time. Through these tools, people can monitor various aspects of their health, such as their weight, heart rate, and sugar levels. It has led to an increase in their motivation to stay healthy. New mobile technologies have also saved many lives. According to researchers, the availability of telemedicine could help improve the healthcare system in developing countries. For instance, a remote community in Australia was able to establish a self-service clinic that provided patients with access to regular medicines (Das, 2021c). Telemedicine is expected to play a massive role in the future, as it can help overcome the shortage of skilled health professionals and reduce travel times for patients.

Patients can receive regular updates from their doctors (Das, 2020a). They can also keep track of their vital statistics using their smartphones. Doctors can also implant wearable devices into their bodies to collect data on various health conditions. About 90% of prostate surgeries are carried out using robots (Mondal, 2020a). Due to their ability to perform the surgery, they are being used more frequently. The ability to perform virtual surgery allows surgeons to improve their capabilities and provide an alternative to traditional open surgery. And it's also being used to treat mental disorders (Sharma et al., 2020).

Discussions

This chapter aims to describe the impact of intelligent technologies on business models. Instead of focusing on the effects of the Internet of Everything on a single firm, we used a service ecosystem perspective to examine how intelligent things can affect resource flows in a network. Using all the digitally published and printed secondary studies, we observed that the intelligent technologies' impact on business models increases with smartness (Das, 2021b). Less sophisticated smart objects may also potentially affect business models at the micro-level. The authors then draw on

our analysis to develop propositions about intelligent devices and their impact on value creation. The various propositions authors observed can be used as starting points for scholars who want to create new insights into innovative technologies' impact on business models.

A. ***Micro-level policies:***

Ending things with smartness may transform the way we deliver services and products to our customers. This benefit can improve the efficiency of our workforce and provide better convenience. According to our observation, high-level smartness can be autonomous and work seamlessly with other people. These tools help customers save time and effort. For instance, when a car's software update is needed, they can ask the customer to arrange for it without the need for the customer to interact with a car maintenance firm (Yegen & Mondal, 2021). The increasing level of smartness helps customers accept intelligent objects. However, this level of acceptance can be affected by various factors such as security and privacy (Duman and Das, 2021, 2021a, 2021b, 2021c). Unfortunately, exchanging data between different bright things can expose sensitive information such as passwords and tell hackers. It could expose them to various security risks.

At high levels of smartness, customers might feel apprehensive about their data being shared with other parties. It could affect their trust in the businesses that use the data collected by these connected objects. Prior studies suggest that companies should communicate the types of data they collect and the purposes for which it is used (Ravi & Mondal, 2021). Despite the advantages of having a variety of intelligent objects, businesses have a hard time developing effective business models that are flexible enough to handle the customers' demands (Siri & Das, 2021). Concerns about the security of the data collected by intelligent objects and the companies that use it can also decrease the acceptance of these products.

From a frontline employee's perspective, intelligent technology tools that allow people to do their jobs better are valuable. This expectation aligns with the literature that shows that adopting technology leads to better customer service and increased employee productivity. However, achieving this advantage can be challenging since implementing innovative technology often involves a lot of work (Das, 2021a). For instance, implementing innovative technology can require much time and effort in healthcare. The right tools and training can help people become more productive and leave their desk-bound colleagues to handle their tasks more smoothly (Sharma & Das, 2021). However, with high levels of smartness, people might feel that they lose their autonomy and decision-making power.

B. ***Meso-level policies:***

Business models are not static, which helps to understand how intelligent digital technologies work. They are constantly being enacted through the actors' resource integration practices. Data flows are the backbone of digitalized business models. They dictate how value is created and how business models can create conflicts or complementarity (Mondal and Das, 2021, 2021a, 2021b, 2021c). Human capabilities

can help minimize risks and make sure that value creation occurs. It is because they can manage the complexity of the process and provide the necessary tools and resources to support value creation (Tiwari & Mondal, 2022). For instance, if a home security system is connected to a mobile phone and a doorbell, this could result in a business model that is not acceptable to insurance companies. Humans play a dual role in the digitalized ecosystem, as they are both moderators and instigators of conflicts among connected business models. They both have their own needs to support value creation.

C. ***Macro-level policies:***

As part of our discussion, we consider the various challenges of studying digital technologies and intelligent things. This chapter shows how connected things can transform the value ecosystems of industries. This convergence leads to new service ecosystems and new business models. Industries do it in the form of digitalized technology-enabled services. One of the most challenging factors in establishing value co-creating ecosystems is choosing the right partners. It is an area where we often encounter conflicts (Mondal et al., 2022). Despite the various transitions in the industry, many firms still struggle to identify the opportunities and challenges presented by intelligent device-enabled industry convergence. For instance, smart cars are becoming more connected, creating intra-industry connectivity between various actors within the car industry, such as parking companies, car-sharing firms, and petrol stations.

Conclusion

The smartness of connected things is brought about by their ability to adapt to new circumstances and act autonomously. This concept supports the need for organizations to have effective networks and processes to enable their connected devices to perform their tasks. Most firms are limited by their path dependencies and require developing a network-based business model. It is where the mutual benefit-sharing agreements come in. There has been debate about how digitalization will affect how we live and work. It is widely believed that we will have entirely new institutional arrangements because of this transition. Innovative technologies cut costs by reducing marginal production, increasing economies of scale, and lowering entry barriers for digital products and services. However, this centralization process leads to a reduction in competition and a rise in social inequality. Various trade-offs influence the dynamics of platform competition. In the case of the Internet of Things and other technologies, this could result in a more fragmented technical landscape. The early stages of the digitalized platform development suggest no clear trend toward consolidation. Instead, the potential of intelligent technologies is only realized when all relevant parties can share data. There is also potential for highly powerful monopolists to pressure other players to acquire their data, but this will likely be managed in new institutional arrangements.

Intelligent technologies will be influenced by how people use the products and services they buy. The concept of service-dominant logic states that people's products and services are designed to serve their needs. The interactions between various entities will become more sophisticated, and the way they operate will also change. This chapter discusses concepts related to smart technologies and how they impact lives for sustainability, which can explore the various levels of smartness and their implications for business models. Through this framework, researchers can develop case studies to help them understand the nature of smartness and its various levels. This chapter targets to help researchers understand the multiple effects of smartness on different stakeholder groups. For instance, the rise of intelligent technologies is expected to trigger new challenges and opportunities.

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Pham Tien-Dung is working as PhD Research Scholar, Institute of Development Economics Research, University of Economics, Ho Chi Minh City, Viet Nam. His research areas are digitalization efficacy, digital transformation, managerial evolution, and digital innovations.

Nguyen Xuan-Doa is a Master Scholar in Ho Chi Minh City Institute for Development Studies, Ho Chi Minh City Government. Xuan-Doa's research interests lie with sustainable living, financial inclusions of digital enterprises, and digital innovations, digital transformation, and digitalization

Subhankar Das (Academician, Researcher, Author, Writer, Blogger, Data Science trainer, Social Media Marketing Consultant) received his Ph.D. in Social Media Advertisement & Media Planning. He has 12+ years of teaching and research experience. He is currently associated as senior research fellow with Institute of Development Economics Research, University of Economics, Ho Chi Minh City, Vietnam. He has published 20+ Research Papers in various International Referred Journals (Scopus, Thomson Reuters, SSCI, SCIE).