CHAPTER 8

The Technologically Sustained Digital Divide

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CONTENTS

8.1 INTRODUCTION

The SDGs emphasize technology-based growth to achieve social sustainability, but is there an inherent tension between the increased use of technology and social sustainability? This chapter argues that there is and that this is demonstrated in tensions between various goals in the United Nation's sustainable development goals (SDGs) (United Nations, 2015). A particular tension I focus on here is between SDG target 9.c which aims increasing access to information and communications technology (ICT), and SDG target 10.1 which aims raising the relative income of the lower 40% within nations. While these might appear to be relative eclectic minor parts of the SDGs, I will argue that this tension is one of the most central challenges in contemporary society: ICT is potentially going to change how we produce and distribute wealth. The tension also involves other goals like SDG 8 which aims at promoting "sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", and SDG 4 which promotes equitable quality education for all.

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I begin this chapter by laying out the main SDGs and the UN's techno-optimistic view of ICTs. While I agree that ICTs can be developed to solve many problems and neutralize disadvantages, I point out one kind of inequality that does not seem to go down with technological advancement, namely the inequalities within countries. In the next section, I begin explaining why economic inequalities are maintained through three stages of digital divides. I then proceed to discuss the economy of digital commodities and how supply and demand will make the digital divide larger as the technology progress. I argue that this process can fundamentally change how we produce and distribute resources in society and draw a parallel to Karl Marx's concept of *mode of production* which he used to describe how mass production enabled the *capitalist* mode of production. Lastly, I discuss and conclude the consequences my analysis has for the pursuit of the UN's SDGs.

8.2 DIGITAL TECHNOLOGY HAS NOT FIXED INEQUALITY

In this section, I will place this chapter's research question within the frames of the UN's Sustainable Development Agendas and explicitly point out the relevant elements of the SDGs. Within these SDGs, I point out an overly optimistic expectation of ICTs to improve society which comes without sufficient justification. I then present some ways ICTs *can* reduce inequalities between people, and why some might believe that the technology will lead to more economically equal societies. I then show that this does not seem to align with the available evidence.

8.2.1 SDGs

SDG 10 takes aim at reducing inequalities, both within and among countries (United Nations, 2015). It is worth noting that this goal targets different levels of inequality; at the macro-level between countries and at the meso- and micro-levels within countries (see Chapter 2). These levels are also evident in the various targets. For example, target 10.1 concerns raising the relative income of the lower 40% of within nations. Thus, this target is aimed mainly at impacting the micro-level. Targets 10.2 and 10.3 are mainly targeted at the meso-level, as it seeks to empower and include various demographic groups. Target 10.6 is an example of a macro-oriented target, where it seeks to ensure enhanced representation of developing countries in international economic and financial institutions. In this chapter, I will primarily focus on the inequalities between individuals and socioeconomic groups, which then places this in a micro- and meso-perspective. And I will be primarily concerned with the UN's goal of reducing inequality within countries.

SDG 9 aims at building resilient infrastructure, fostering inclusive and sustainable innovation and industrialization. Promoting ICT and providing universal internet access to the least developed countries are explicitly mentioned as one of the targets (9.c) of this goal. Thus, the UN considers ICTs and particularly the internet as resilient, inclusive, and/or sustainable technology – at least *potentially*, as discussed further in Chapter 18. In Agenda 2030, it is claimed that

> [t]he spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital

> divide and to develop knowledge societies, as does scientific and technological innovation across areas as diverse as medicine and energy.
>
> (United Nations, 2015, p. 5)

However, very few details on the mechanisms for how this is achieved are provided. This optimistic view of the potential for ICTs to improve society ignores potential adverse effects and relies on an overly simplistic view of the *digital divide*, as I will show later in this chapter.

8.2.2 Techno-solutionism and the Notion That Access to Digital Technology Can Reduce Inequality

Information and communication technology certainly be used to empower the less privileged. Some of these solutions have been highlighted in other chapters of this book. For example, Deschling and Nordahl-Hansen (Chapter 7) use virtual reality to help people with autism disorder develop social skills, and Tschopp and Salam (Chapter 9) explore the potential impact of AI on gender and discrimination. Education is another prime area discussed by Selwyn in Chapter 6. He deals with the idea that it is often assumed that harnessing information and communication technologies is a requirement for strengthening "education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision" (OECD, 2021, p. 5).

Despite the potential improvements that digital technology brings to the life of people with various disadvantages, these are generally solutions in the form of products to be consummated by the disadvantaged. In this chapter, I focus instead on how ICTs influence the production process and employment of people. Some might think that providing access to digital tools will obviously bring the developing world up the economic speed of the developed. After all, the digital technology sector is a highly lucrative sector with high-paying jobs in many parts of the world right now. If the poorer workers of the world could participate in this economy, they could significantly improve their financial situation. At least that is how the story goes. Next, I show that this does not seem to be the case as most people in even highly digitalized societies don't possess advanced digital skills and that inequalities within countries seem to be increasing.

8.2.3 Lagging ICT Skills and Increasing Inequalities Within Countries

The SDG target 9.c related 2021 report from the International Telecommunication Union (ITU) shows the potential benefits of being online. We find that access to the internet is increasing rapidly across the globe (especially in the least developed countries) with a current estimate of 63% of the world population being online and 95% covered by a mobile broadband network (Bogdan-Martin, 2021). Further, the ITU claims that

> ICTs and the Internet have been vital in maintaining continuity in business activity, employment, education, provision of basic citizens' services, entertainment, and socializing. Digital platforms and services have enabled countless innovations

> that helped mitigate the health, social and economic costs of the tragedy, and build resilience against future crises.
>
> (Bogdan-Martin, 2021, p. iii)

However, the report also emphasizes that digital skills (or lack thereof) constitute an important bottleneck for getting people online when they have coverage, and a hazard in terms of vulnerabilities to cyberattacks, scams, fake news, or harmful content when online (Bogdan-Martin, 2021, p. iv).

The UN tracks ICT skills as a part of the SDG 4 (target 4.4) (United Nations, 2021a) and divides them into three different levels: Basic, Standard, and Advanced.[1] The ITU 2021 rapport (Bogdan-Martin, 2021, p. 20) shows that basic skills are quite well dispersed in countries with high internet access. The standard skills distribution is lower. Only three (out of 76) economies have more than 60% of their population performing computer tasks like installing new software, creating presentations, or using spreadsheets. No economy was reported with a standard skill proportion higher than 80%. And only 11 of the economies had advanced skills over 10%, and no economy with advanced skills over 50%.

So, what is the status of SDG 10 with regard to the inequality between and within countries? Developing countries have in recent decades been catching up somewhat, which lowers the inequality *between* countries. However, economic inequality *within* most countries is growing (Chancel et al., 2021). Despite the increasing availability of ICT, we do not see any evidence that it has reduced the inequality between individuals. On the contrary, as I will show in the next section has ICTs likely contributed to the increased inequality between people.

8.3 WHY DIGITAL TECHNOLOGY HAS NOT FIXED INEQUALITY

In this section, I will show how ICT inequalities extend beyond access to hardware and software and are working to sustain and increase socioeconomic inequalities. I first focus on the individual perspective where the accumulation ICT resources (including skills) tends to be stronger among the already advantaged, which creates a growing divide in terms of these resources. Then I focus on market mechanisms of supply and demand, and how ICTs are changing the demand for various labors. These two mechanisms are complementing each other and pose a substantial threat to the UN's goal of reducing inequalities within countries (SDG 10).

8.3.1 3 Levels of Digital Divide Theory

The UN states that the rationale for target 9.c is to "highlights the importance of mobile networks in providing basic as well as advanced communication services, and will help design targeted policies to overcome remaining infrastructure barriers, and address the digital divide" (United Nations, 2021b). This formulation witnesses an understanding of the digital divide as a distinction between those that have access to the internet from those who do not. The digital divide is consequently portrayed as an infrastructure problem that can be solved by laying cables and building towers.

In contrast to this, I will now present a broader alternative view from sociological research where the digital divide is a *layered problem* where new divides surface as more individuals and groups get physical access (van Deursen et al., 2017; van Deursen & van Dijk, 2014; van Dijk, 2020; Farooq, 2015; Norris, 2001; Selwyn, 2004).

Three levels of the digital divide have been identified (van Deursen et al., 2015). The first level is the classic division between the digital "haves" from the digital "have-nots", defined by who has access to hardware. This is where we find the UN formulation mentioned earlier (United Nations, 2021b). It was noted early on that this access followed existing socio-economic divides. The educated and wealthier part of the population got access first (van Dijk, 2020, p. 1; NTIA, 1995). As hardware access becomes more universal, a second-level digital divide emerges (van Dijk, 2020, p. 9). This denotes disparities in digital skills and usage patterns. Again, already advantages people tend to have the most advanced digital competencies and display the most advantageous use patterns (Cottom, 2012; Rohs & Ganz, 2015; Scheerder et al., 2017). The third level of the digital divide closes the causal loop, as it concerns how the aforementioned disparities in ICT use influence socioeconomic outcomes (van Deursen et al., 2015; Scheerder et al., 2017).

To explain the relationship between the three levels of the digital divide, van Dijk (2020) proposes a *resource and appropriation theory*, where personal and positional inequalities lead to resource inequalities that in turn determine the process of technology appropriation. The theory is summarized in the five following points (van Dijk, 2020, p. 31):

1. Inequalities in society produce an unequal distribution of resources.
2. An unequal distribution of resources causes unequal access to digital technologies.
3. Unequal access to digital technologies also depends on the characteristics of these technologies.
4. Unequal access to digital technologies brings about unequal outcomes of participation in society.
5. Unequal participation in society reinforces inequalities and unequal distributions of resources.

Further, van Dijk (2020, p. 117) remarks that to understand the workings of the third-level digital divide we need to consider the characteristics of contemporary society. Production of information is becoming more important than material goods, and new digital media facilitates the network society and increase relative inequality. This stratifies society into the information elite, the participatory majority, and the unconnected and excluded.

There is reason to believe that these digital divides exacerbate economic inequality. The rationale is straightforward and simple; high-skilled workers develop and use new technology that replace repetitive tasks previously performed by low-skilled low-income earner. This makes the high-skilled workers more productive, earning them more income. And low-skilled workers are left unproductive, losing their basis for income (Acemoglu, 2002; Brynjolfsson & McAfee, 2014; Danaher, 2019).

Thus, the three levels of digital divide demonstrate how ICTs can *prevent* the achievement of some of the targets in SDG 10. More specifically, it means that hitting target 9.c can come with a cost to target 10.1 and the reduction of relative inequality within countries. That is, while providing universal internet access to the least developed countries will give everyone access to extra technological means, it is likely that it is the already relatively advantaged people within these countries that will benefit the most from this technology. This could then reduce the relative income of the bottom 40 %, which is directly opposed to target 10.1. In the next section, I will go a little deeper into the economic mechanisms that show how digital technology is likely to drive economic growth, which reduce the inequality between countries but simultaneously increase inequality between individuals.

8.4 WHY DIGITAL TECHNOLOGY WILL NOT FIX INEQUALITY

Achieving target 9.c and providing internet access to developing and least developed countries will undoubtedly open up new economic opportunities. One can view the emergence of the digital technology as the modern economic frontier. If the new opportunities are seized, we get economic growth, which is also one of the 17 SDGs (8). Providing digital infrastructure (reaching target 9.c) could then be an opportunity for developing economies to catch up to developed economies while simultaneously hitting target 8.1 of achieving 7% per capita economic growth and SDG 10 reducing inequality between countries. However, digitalization-driven economic growth could also have undesirable effects on inequality *within* countries.

The impact that digital technological progress has on inequality has been subject to much debate. For example, the influential book *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (Brynjolfsson & McAfee, 2014) advances the notion that digital technology is driving a new industrial revolution. This revolution has two main effects on society that the authors refer to as *bounty* and *spread*. The bounty refers to promising economic benefits in terms of increased quality, variety, and volume of production. The spread refers to the potential socioeconomic inequality that ensues "unless we intervene" (Brynjolfsson & McAfee, 2014, p. 15). Inspired by Brynjolfsson and McAfee (2014), I will in the following paragraph lay out my understanding of how digital technological progress influence the economic conditions.

Digital technologies are rapidly and suddenly capable of performing new tasks. Similar to the way that the steam engine replaced manual work in the first industrial revolution are computers replaced cognitive work in the second machine age. Today machines are capable of driving cars and simple clerical tasks. In general, tasks that rely on a predictable set of actions are well suited for automation. Because the technological change in the first industrial revolution automated manual labor, it not only required the physical construction of factories to implement but also limited the speed at which replacement could happen. The predictable set of actions in cognitive work can be written in software code and distributed over the internet. The implication is that there is almost no marginal cost of production. That is the extra cost of producing an extra unit. Or, in other words, the cost of producing a computer program on computer compared to the cost of producing the same computer program and installing it on a 1 million computers are practically indistinguishable. Suppliers of these programs can sell these programs for nearly nothing and still make profits. This is great for the suppliers of the program and the consumers who get high-quality products at very low price and often free. But the humans who used to perform these tasks by the power of their own cognition are now faced with a dramatic increase in competition, that is not possible to meet. This means that a small team of developers can outcompete whole sectors of workers overnight. The laid-off workers would need to find new jobs in other industries or remain unemployed. Workers that relocate to other industries introduce extra supply of labor in the other industries. If the other industry does not experience at least equivalent increase in demand for labor, the extra supply of workers will bring extra competition and drive down wages in these industries. Because it would require less training to relocate to low-skilled employment, the automation of one low-skilled employment will bring down the wages of all low-skilled employment, all else equal. On the other side are workers who pose the right skills that are commentary to digital technology, either by further developing the machines or seemingly unrelated professions like athletes and authors. The market value of these latter mentioned professions can be enhanced many times with new digital broadcasting technology. In any case is it the skills that are hard for computers to replicate that is the future.

Then, it is perhaps not that surprising that the recommendation, for both individuals and policymakers, is to develop these skills (Brynjolfsson & McAfee, 2014, p. 167) and to unlock “billions of innovators” (Brynjolfsson & McAfee, 2014, p. 84). SDG target 10.1 explicitly specifies that the goal is to raise the income of the lower 40% faster than the national average. This be challenging, given that the UN digital skills indicator data show that it is rare to find economies with an above 60% proportion displaying moderate digital skills (Bogdan-Martin, 2021, p. 20). And as the three levels of the digital divide suggest, it is usually the lesser economically advantaged that are also lacking the digital skills. The implication of this is most likely that the already relatively advantaged laborers will primarily benefit in terms of wages from the digitalization of the economy. Laborers that don’t keep up to speed with their skills to match the pace of technological progress get disconnected from an accelerating skill-demanding labor market with accelerating demands for skills, and catching up becomes harder with time. The economist Markovits (2019) argues that this mechanism has already dismantled the middle class in contemporary United States and makes the professional elite work with crushing intensity to stay ahead.

Now, higher wages for the top earners could cause them to spend more on commodities that are produced by the lower earners, and thereby indirectly raise the wages of the lower earners. This is the standard assumption in certain market-based economic theories based on the “trickle-down” principle and that rising tides raises all boats (Arndt, 1983; Sowell, 2013). But such mechanisms would not raise their wages at a higher rate than the national average as it would raise the average at a faster rate.

8.4.1 Mode of Production

As noted earlier, Brynjolfsson and McAfee (2014) see the emergence of digital technologies as the dawn of a new (second) industrial revolution. In the former industrial revolution, mass production emerged and transformed the way people worked, lived, and related to one another.

Karl Marx observed this and coined it the *capitalist mode of production* (Marx, 1959, Chap. 51). Every society has a particular mode of production which captures the relations of production and distribution. One of the distinguishing features of the *capitalist* mode of production was the dominant role of production of commodities, with wage labor as the dominant role of labor.

The steam engine was a technology that made mass production in factories possible, which also relied on wage labor. Hence, new technologies have the potential to disrupt the mode of production by rendering social arrangements obsolete and spawn new social relations compatible with the given technology (Barley, 2020). If digital technology instigates an industrial revolution as Brynjolfsson and McAfee (2014) suggest, then it should also be asked; are we also facing a new *mode of production*? Answering this question is beyond the scope of this chapter, but reflecting on the question is nonetheless useful if we want to understand how ICTs shape inequality. With the production of information becoming more important than the production of material goods, the mode of production of information also becomes more important for understanding inequality.

To shed light on the mode of production of information, I will now give a simplified description of it. Hence, the reader should not consider this the full description of contemporary economy, but instead as tendencies that might only become more pronounced as the digitalization of the economy progress.

Contemporary information and communication technology allow for information to be gathered, transformed (computed), and distributed with very little human effort. Thus, an information product, for example, a software program or a text, can be copied and sold with practically no marginal cost of production. It does not make much difference in terms of labor hours spent if the computer program is downloaded by 1 person or 5 million persons. Hence, this technology has the potential to make individuals extremely productive.

Digital technology enables a few to produce and provide products and services that can be used by increasing numbers – sometimes almost unlimited – users. Simultaneously, the application of digital technology replaces lower-skilled labor. In combination, we see that the technology has the potential and the economic incentives to produce both economic growth and economic inequality between individuals with different skills.

When there is competition between producers, this will then quickly drive down the unit price to a near-irrelevant level for buyers. These buyers can then choose the product that provides the highest utility at very little cost, while the producer (or seller of the product) can earn massive profits fast. This is perhaps most evident in the mobile app market where everyone with some programming skills and a computer can launch their own software in a fast and streamlined way.

While this is potentially great for both consumers and successful producers, for others this can pose a threat to their income, access to capital, and relative value in the markets. Increasingly sophisticated robots and software, for example, can reduce the value of labor. Every task that has a predictable set of procedures can in principle be automated (Danaher, 2019). The displaced workers either have to learn new (often more advanced) skills or find lower-skilled jobs that have yet to be automated for some reason. While learning new advanced skills can be feasible for some, for others it can be near impossible. And if they migrate to other lower-skilled jobs, they will compete with others that are already in these jobs and thus bring down their wages with their extra labor supply. And even if we could retrain everyone to be product developers, it is hard to see how everyone could produce something that was both unique and useful enough to be in demand.

Marx (1959, Chap. 15) famously predicted the overthrowing of capitalism as a mode of production by the proletariat as a consequence of falling rate of profits. However, this prediction has thus far failed, and subsequent theories have argued that capitalism is far more adaptive than Marx gave it credit for. Josef Schumpeter (1942) argued that the process of *creative destruction* sustains long-term economic growth and keeps capitalism as the optimal mode of production. Schumpeter instead predicted instead that it would be the success of capitalism that would eventually lead to its collapse (Schumpeter, 1942).

Borgebund revisits Schumpeter's analysis of capitalism in Chapter 12 and argues that said mode of production has the potential to survive also into the digital future. The argument forwarded by Borgebund is that capitalism has proven highly adaptive and this adaptability is likely to carry capitalism into the future. But this begs the question; at what time has capitalism adapted itself into something other than capitalism?

In Marx's theory of social change, a society's mode of production often contains remnants of earlier modes of production together with seeds of new modes of production (Marx, 1959, Chap. 51). Today we still see relics of the feudal mode of production, like the nobility in the Great Britain. Simultaneously are we witnessing new occupations social media influencers (Edwards, 2022; Khamis et al., 2017) and sprouts of new social classes like the precariat (Standing, 2014). While the former appears like the utopian vision for many individuals, most people are more likely to find themself in the latter situation, characterized by temporary and part-time employment without job security in the gig economy (Woodcock & Graham, 2020).

Hence, it is not unreasonable to argue that we are perhaps witnessing the dawn of a new social order brought about by technological change into the digital mode of production. If the capitalist mode of production will be sustained in the second machine age remains to be seen. While the central tenet of both Marx's and Schumpeter's evolution of capitalism is that socialism will follow. But, perhaps socialism is not inevitable next mode of production and it is not likely that it will be the same across the globe. Marx emphasized the historical preconditions in the development of any mode of production (Marx, 1959, Chap. 51) and commented on his contemporary society which was Western Europe in the 19th century. This capitalist society emerged from the feudal society that preceded it (Marx, 1959, Chap. 36) and was marked by mass production. Today, some Marxist scholars are advocating that we must consider a myriad of interconnected causes to grasp the evolution of a social system, which complicates any general future for capitalism (Althusser, 1969; Burczak et al., 2018). For example, some have argued that democracies are more likely than autocracies to redistribute resources (Acemoglu & Robinson, 2006; Boix, 2003), but empirical studies have also found significant heterogeneity which complicates this relationship (Albertus & Menaldo, 2014; Dorsch & Maarek, 2019; Houle, 2009; Knutsen & Rasmussen, 2018). Following the argument for an analysis which considers interconnected causes will any evaluation of the change in mode of production need to be society specific and account for the specific historical precondition and the specific production process in that society. This implies that the changing mode of production could influence different parts of the world differently, and lessons learned from one part do not necessarily translate directly into another part. It is beyond the scope of this chapter to evaluate all possible trajectories that the mode of production can take in various circumstances. However, it seems clear that digital technology is likely to change how things are produced and consequently how resources are distributed, and how this relation of production and distribution will look in the future is uncertain and likely to depend on local contexts. With that in mind, I will proceed to explore how ICT can affect the unequal distribution of resources in developed and developing parts of the world and close to the implications I see that this has for the pursuit of the SDGs.

8.5 CONSEQUENCES OF THE SDGS AND SUSTAINABILITY

Full broadband coverage has not yet been achieved by much of the developing world, and the third-level digital divide is a phenomenon that is primarily studied in the Global North. It remains to be seen if lessons learned from European welfare states are transferable to the developing economies, and we can only speculate how this will pan out. However, as I have argued in this chapter, digital technology has particular properties that lend itself to a mode of production which primarily rely on a skilled elite. Sociological research on the digital divide shows that ICT resources beget ICT resources and tend to reinforce socioeconomic inequalities. Inequalities within countries are rising, and individual differences are becoming more important. The production of ICT favors highly skilled labor, and many are struggling to keep up. ICTs are also finding evermore task to automate, which generally reduce the demand for low-skilled labor and punish them that do not adapt. When developing economies connect to the more digitally matured economies of the Global North, it can crack open new digital divides both across and between countries. Digital elites in developed countries have a head start in developing their strategic and technical skills which can put them in advantageous positions to profit from the new business opportunities that emerge. However, it is also likely that there will develop digital elites within the developing economies, like they have in the Global North. These can create new business opportunities and further advance technology within and abroad. This can accelerate the economic growth of the developing countries to partly catch up with the developed economies. But, where there are elites, there are also likely to be non-elites that struggle to acquire digital skills in developing nations, just as in the developed nations. Low-skilled labor is likely going to suffer extra pressure from automation, and much low-skilled labor is currently performed in developing nations. These are also often nations that don't offer the same degree of welfare benefits as many of the developed nations, which could dampen the consequences for these individuals. Thus, the digital divide could have more severe consequences in the developing world than what we have observed in the developed nations.

Then as for the effects of target 9.c on economic inequality within and between countries, we can see that hitting target 9.c can help to sustain economic growth and by extension reduce economic inequality between countries. However, target 9.c can simultaneously produce higher income inequality within countries. This inequality can be hard to counteract, and relying on education (SDG 4) to bridge the gap ignores the accumulative tendency of digital skills and how the marginal cost of production of digital commodities affects labor demand. While catch-up economics might work for countries, it will likely not work the same way for individuals.

NOTE

1 The digital skill level is operationalized by the ability to conduct specific tasks. Basic: Copying or moving a file or folder. Using copy and paste tools to duplicate or move information within a document. Sending e-mails with attached files between a computer and other devices.
- **Standard:** Using basic arithmetic formula in a spreadsheet. Connecting and installing new devices. Creating electronic presentations with presentation software. Downloading, installing, and configuring software.
- **Advanced:** Writing a computer program using a specialized programming language.

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