

Persistently High Levels of Youth Unemployment in the 4IR Digital Society: A Structuration Theory Perspective

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Abstract

The 4th Industrial Revolution entails the adoption and integration of information and communication technologies leading to an increasingly digital society. This article contributes to concepts and applications of structuration theory and unemployment in 4IR literature and highlights research on societal barriers to digital transformation resulting in youth unemployment. We argue that social strata and socio-economic factors can have significant consequences for unemployed young people. These factors create and exacerbate existing divides that hinder equal access to the benefits of an increasingly digital world. The study findings reveal that one of the biggest challenges faced by most countries, is ensuring that the growing cohort of unemployed youth, with low digital literacy skills and little or no enabling resources, are given the opportunity to participate in the rapidly developing digital society. Technological advances, resulting from the 4IR, need to be better understood by using enabling concepts such as structuration theory. The article enhances a deeper understanding of the impacts of the 4IR in a developing country context and may offer insights into how policies and initiatives need to be revisited to address problems such as high youth unemployment. The 4IR is disrupting traditional economies and employment opportunities at an international level, but there are subtle differences from a developing country perspective. This article's relevance is its contribution to structuration theory and its application within the literature on the 4IR. There remains an absence of understanding how best to encourage active citizen participation in the 4IR, especially in developing states with high levels of inequality. We conclude by presenting policy recommendations.

Keywords: 4th Industrial Revolution (4IR); social strata; unemployment; information and communication technologies (ICT) advances; socio-economic measures; digital society; structuration theory



Introduction

The new and advanced technologies of the current 4th Industrial Revolution (4IR), like other technologies and innovations from previous eras, have drastically transformed several aspects of society. Yet, at the same time, many countries are experiencing a high level of unemployment and inequalities in the distribution of technology infrastructure and sufficiently widespread quality access to the digital world. This has a direct impact, particularly on less well-educated youth who are unemployed and seeking opportunities to become economically active. The issues of high levels of youth unemployment, and differences in access to the internet and technological enablers, remain an international challenge. High rates of youth unemployment have become an international problem in recent years. At large, transformations in society resulting from technological advances have created new barriers for youth who are unemployed and seeking work opportunities. In addition, socio-economic factors further divide social strata and inhibit active participation in the 4IR digital society in several ways.

Recent literature points to the growing uncertainty concerning the impacts of the 4IR in taking away jobs currently performed by people employed in various sectors. This has led to some suggestions that the 4IR will result in job losses (Rapanyane and Sethole 2020). Each Industrial Revolution (IR) has led to transformations in technology, the labour market and the functioning of society. The digital age has automated various business processes in society, and these changes have been beneficial to people in society, but these benefits have not been evenly distributed. The fear of the 4IR digitising some of the entry level and unskilled level jobs (currently performed by humans) and thus taking away jobs, is not a new phenomenon. For instance, in the 18th century, the start of the industrial revolution drastically changed life and employment patterns on the planet (Picatoste, Perez-Ortiz, and Ruesga-Benito 2018) as urbanisation accelerated, whereas Webster (2002) points out that the debates concerning industrial revolution technologies taking away jobs from people could also be found during the 19th century. In the same vein, MacLeod (2007) states that during the 1IR, a group of workers sabotaged firms that were using new machines, as these machines were seen to be taking jobs away from the people. In contrast, Nam (2019) highlights that there is still a belief that new types of jobs, occupations and ways of doing tasks will emerge from the 4IR. In essence, older business processes make way for new types of business processes using advanced technologies and new types of jobs replace those made redundant by the new technologies.

This article has been compiled at a time when many countries are experiencing a high level of unemployment, particularly among young people. Forecasts regarding the impact of the 4IR on society, development and employment are acknowledged as complex, given the current inequalities prevalent in many societies, as well as unemployment and uneven information and communications technology (ICT) infrastructure distribution. The challenge of uneven ICT infrastructure rollouts, as well as inadequate skillsets, hinders people living in underserved communities from

actively participating fully in the digital society, as has been shown in recent research conducted in South Africa (Matli and Ngoepe 2020). Matli (2020), in a study on remote working during the Covid-19 pandemic, found that segments of South African society are still characterised by wide differences in socio-economic levels, uneven service delivery, and ICT infrastructure development. The uneven internet network coverages, as well as quality of access, impose particular challenges for some communities and consequently their ability to be active participants in the 4IR and to fully participate in the digital economy. Much of the literature confirms that a lack of access to the internet and digital literacy skills compromises the effective use of the new ICT infrastructure (Matli and Ngoepe 2020; Department of Communication and Digital Technologies 2020; Strover 2014). As a consequence, there is a need for widespread and robust ICT infrastructure to be in place to allow the benefits of the 4IR to reach all levels of society. Affordable and accessible ICT infrastructure is thus required to reach citizens in disadvantaged communities and rural areas.

Several studies have been published about the impact of the 4IR on employment. Recent research studies carried out by scholars such as Sutherland (2020), Ayentimi and Burgess (2019), and Rainnie and Dean (2020) demonstrate that there continues to be considerable research interest in the impacts of the 4IR, especially around issues such as employment. In his study, Sutherland (2020) focused on South Africa and the 4IR and found that poor quality infrastructure and heightened inequality remain challenges. Ayentimi and Burgess (2019) in their study examined the 4IR in sub-Saharan Africa and found that it has the potential to negatively impact all industries and all nations if the current ICT infrastructure deficits do not receive sufficient attention. Rapanyane and Sethole (2020), in their study that looked at the 4IR implications on job creation in South Africa, found that the 4IR will have an immense impact on job opportunities and job creation. Other scholars have delved into the 4IR and the future of work (Rainnie and Dean 2020). More understanding is emerging, and an increasing body of evidence is growing on the topic.

The digital transformation continues to have an impact on jobs at multiple levels. The increase in the use of some emerging technologies, as part of the 4IR, is having a direct impact on employability. As new forms of technology are adopted, like automation and artificial intelligence (AI), many organisations can enhance their business processes and the efficacy of their production and operations. A key argument emanating from this review article is the necessity to better understand how prevailing inequalities in the form of social structures and socio-economic conditions contribute to high levels of unemployment and inequality, despite the clear benefits of the digital revolution. The challenges associated with youth unemployment in the digital era arise from a poor understanding of how new technologies are rolled out and how digital transformation is implemented. Current policies and interventions, meant to address the high levels of youth unemployment in the digital era, are often inadequate and ineffective; an example being the disparities between residential and business areas in technology infrastructure distribution and digital access, particularly among unemployed youth. This review

article intends to highlight how new technology can create a barrier for some youth to leave the ranks of the unemployed because of digital transformation occurring in the workplace. There is a need to acknowledge that social strata and existing socio-economic divides must be addressed as part of digital transformation. Therefore, this article aims to add to the literature on this topic. This will be achieved by applying structuration theory to the subject in a South African context, so that the effects of the 4IR can be more clearly understood.

Overview of Industrial Revolutions (IRs) and Employment

A review of the literature suggests that there have been four industrial revolutions to date, with the 4IR currently ongoing. There is no consensus regarding the exact dates when the first three IRs took place and discomfort exists regarding the current IR's heterogeneity (Tunzelmann 2003). Several theories and definitions have been cited in describing the technological advances that formed part of each IR. As a result, this enables one to define an IR in several ways. This paper focuses on certain technologies that characterise each IR in terms of impacts on social structures.

1st Industrial Revolution (1IR)

During the 1IR, technical problems faced in production by manufacturers resulted in the development of machines that would get the job done more efficiently and effectively (Tunzelmann 2003). Tunzelmann (2003) suggests that the 1IR first took place in Britain in the late 18th century, more specifically between 1750 and 1815, and the new technologies focused mainly on machinery. Dalenogare, Benetez, and Ayala (2018) claim that the first industrial revolution took place between the years 1780 and 1840, with the focus mainly on the development of steam machines. Eden (2018) is of the view that the 1IR focused on water and the steam engine and that it took place between 1760 and 1840. Eden (2018) further points out that during the 1IR, there was rapid growth in the textile and iron industries.

Though the literature around the impacts of the first industrial revolution has been growing in recent years and scholars have been generating interest in the nuances of the subject matter, researchers still differ in defining the period covered by the 1IR, and various terminologies are employed to describe it. Regarding the timeframe of the 1IR, Tunzelmann (2003) claims the 1IR took place over a 65-year period (1750–1815), whereas Dalenogare et al. (2018) suggest the 1IR took place over a period of 60 years (1780–1840), and Eden (2018) claims the 1IR lasted for 80 years (1760–1840). Regarding what machines revolutionised the industry, the literature points out that waterpower and the steam engine were the critical technologies of the 1IR. Internationally, significant variation exists between the application and the scope of the 1IR, and this depends on the location, industry/sector and the context in which the new technologies were applied. As a result, it is often difficult to be precise around the timeframe and scope of the 1IR because of the heterogeneity surrounding its emergence.

This article concludes that flexibility is required when discussing each IR, as the experience differs, dependent on the country and technology being analysed.

Labour was a critical resource during the 1IR, and later, industries were tailored for machine-assisted labour (Tunzelmann 2003). Workers were trained to support machines during the 1IR with relevant technical skills and knowledge needed to operate new machines and technology. In this way, manufacturing firms, with means, were able to take advantage of the machines and technologies to improve their productivity. This competitive advantage meant other manufacturers followed suit across the world. The technology advances, such as waterpower and steam engines, resulted in new types of jobs that were not available before. However, the traditional ways of manufacturing were impacted through either the loss of jobs or the failure of enterprises that did not adopt the new technologies.

2nd Industrial Revolution (2IR)

The 2IR was dominated by the use of electricity in industrial processes towards the end of the 19th century (Dalenogare et al. 2018). The telephone and electric power were some of the new technologies that drove the 2IR between 1850 and 1920 (Eden 2018). Eden (2018) further adds that it was during the 2IR that modern business information systems began to emerge. Tunzelmann (2003) believes that the 2IR was led by both Germany and the USA late in the 19th century, largely between 1870 and 1914, and the new technologies included the use of chemicals and labour-assisted innovative machinery. Similar to the 1IR, there seems to be a lack of consensus regarding the time frames, locations and new technologies that characterised the 2IR.

The introduction of advanced technologies such as the telephone, business information systems and electric power from the end of the 19th century resulted in new types of jobs in the labour market. People with relevant skills and knowledge were able to gain employment in the new types of jobs as they emerged. People had to be skilled so that they could stay relevant in the new jobs. Although the literature states that the 2IR commenced in the late 19th century, this does not mean the spread and adoption of the new technologies were uniform across the world. The spread depended on the infrastructure and other resources required before the benefits could be realised. More developed nations were able to actively participate in the 2IR long before much of the developing world. This reflects the inequalities between countries that persist to this day in many parts of the world.

3rd Industrial Revolution (3IR)

The dawn of the 3IR saw the launch of automated machines that assisted in the manufacturing process (Fiorelli 2018). The 3IR emerged during the 1960s, focusing on the use of ICTs and industrial-level automation (Dalenogare et al. 2018). Tunzelmann (2003) is of the view that the 3IR occurred later in the 20th century, from about 1973, with technological advances in both biotechnology and ICTs that assisted in

transforming and accelerating the information processes associated with automation. Eden (2018) goes back further than Tunzelmann (2003) and Dalenogare et al. (2018), by proposing that the 3IR began around 1950 with the introduction of semiconductors and circuits, and it was later followed by the mainframe computers of the 1960s until the invention of the world-wide web and the internet in the 1990s.

The period 1950–1990 for the 3IR is certainly supported in the literature by the emergence of semiconductors, circuits, mainframe computers and the internet (Dalenogare et al. 2018; Eden 2018; Nam 2019; and Tunzelmann 2003).

The 3IR introduced new types of jobs, requiring new skills, largely in operating automated machines in the manufacturing space and ICTs in the information processes linked to automation. The adoption of new technologies was not uniform. Organisations with resources and who acquired staff with the requisite skills were the first to adopt and benefit from the new technologies. Many Asian countries were quick to adopt the new technologies, while much of the rest of the developing world took longer to adjust to the changes triggered by the 3IR. People were required to have the essential skills and knowledge needed in the marketplace for using these new technologies. Technical computing skills were an important requirement to participate in the 3IR, such that some workers had to reskill themselves to either stay relevant in their jobs or switch to new employers. This disruption to the labour market continues and has been accentuated further still by the 4IR.

4th Industrial Revolution (4IR)

The terms “Industrial 4.0” and “4IR” are used interchangeably in the literature (Dalenogare et al. 2018; Eden 2018; Serpanos and Wolf 2018). Germany coined the term “Industry 4.0,” whereas in the USA, this paradigm shift was termed the “Industrial Internet” (Serpanos and Wolf 2018). Dalenogare et al. (2018) are in support of the view by Serpanos and Wolf (2018) that Industry 4.0 emerged in Germany from decisions to build smart factories by integrating digital technologies with physical infrastructure or machines. Lu (2017) offers a slightly different view, suggesting that Industry 4.0, also referred to as the digital factory, was coined in the UK to represent a live laboratory for entrepreneurs to better understand and adopt the possibilities of ICTs and computing advances in their production and manufacturing systems. Eden (2018) supports the views of Dalenogare et al. (2018) and proposes that the 4IR emerged around the year 2000 with the rapid spread and adoption of digital technologies. The 4IR is dominantly centred around ICTs, the miniaturisation of computing technologies and the changes it permits in various industries. For example, the 4IR may be described as the further advancements of some technologies from the 3IR, like the internet (Eden 2018). The 4IR refers mainly to the present and potential future developments that using ICTs will have in transforming the workplace (Teng et al. 2019). Schwab (2017) further adds that the 4IR is predominantly centred on transformations in manufacturing systems resulting from the integration of ICTs with manufacturing processes. Therefore, the 4IR is characterised by rapid change, mainly because of these disruptive technologies that

continue to innovate and change the face of the labour market and the skills required to participate in the digital economy (Eden 2018).

Though the literature on the 4IR is mounting, the absence of agreed international standards and benchmarks to define and describe the period and the technologies it encapsulates, remains (as with the earlier IRs). With a lack of universally accepted definitions for the 4IR, and the debates still ongoing, this article rather subscribes to a broad umbrella approach to the 4IR as a socio-economic-technological phenomenon. In particular, the article focuses on 4IR jobs and societal development factors, a sub-category of the literature that is emerging.

There are many positive improvements, benefits and developments occurring in society because of the 4IR. These benefits, however, come at a time when many countries are battling high levels of unemployment, particularly among the youth cohort, as well as inequitable access to resources and new technologies. This, therefore, creates the notion of the digital divide associated with the 4IR that is largely driven by socio-economic factors. The high levels of youth unemployment equate to government failures to adequately prepare society to take advantage of the new technologies and the new types of jobs they create. For example, The South African Department of Communications and Digital Technologies (2020) points out that both the manufacturing and services sectors are being transformed by automation, AI and a range of other digital technologies. Government must provide support and favourable environments for youth to acquire relevant skills and knowledge on the type of jobs that will be demanded in the marketplace, and are in line with automation and the digital economy. Most youths in disadvantaged communities in South Africa lack the relevant skills and access to ICT infrastructure to engage with the 4IR. This results in many young people failing to find work, therefore remaining unemployed for long periods. This situation is exacerbated by the digital divide that exists in many countries.

Societal Barriers Faced by Underprivileged Youth in the Digital Society

The current 4IR presents several opportunities for youth who are unemployed to retrain themselves and consider careers more streamlined to the labour market demand. Opportunities have been created for career advancements through self-help initiatives. However, the 4IR has created uncertainty in society and comes with numerous challenges for those unprepared. There is a need to better understand how new technologies are affecting those attempting to enter the workplace for the first time, and how social strata and socio-economic conditions are excluding certain cohorts from employment opportunities—especially the youth.

Ensuring people have access to the internet will not automatically diminish the current high rate of inequalities within the digital space (Marien and Prodnik 2014). As stated earlier, South Africa is characterised by a digital divide resulting from the high levels of inequality already prevalent in society. In their report prepared for the Gauteng Province Premier's Office, Steyn Kotze et al. (2019) cite that most young people in the

province do not have adequate access to essential services, including ICTs. However, access alone to enabling resources and infrastructure will not end the existing divide. Marien and Prodnik (2014) further state that advantaged and educated groups, in terms of internet access and a high level of digital skills in the more affluent communities, continue to gain direct benefits from using ICTs, while disadvantaged groups with low levels of education, low digital skills levels and compromised access to the internet, are being left behind. Therefore, upliftment of the underprivileged groups remains essential, as the inequality gap continues to grow between those with means and those with little or no means to access online services (Matli and Ngoepe 2020). It is vital to ensure that underprivileged, unemployed people have the right skills and the means to access ICTs in order to participate actively in the 4IR and the digital society.

Without a considered, well-funded and well-coordinated effort involving all key stakeholders to address the aforementioned problems, current inequalities will persist and the goals of reducing youth unemployment and ensuring equal opportunities for those entering the 4IR impacted labour market from disadvantaged communities, will remain a pipe dream in South Africa.

Certain jobs still cannot necessarily be performed by machines (Picatoste et al. 2018). In the same vein, Fiorelli (2018) adds that machines cannot operate solo for the entire production process. Therefore, they require operational assistance from suitably skilled workers, which will necessitate new types of jobs that include, among others, jobs for people with certain skills to perform the maintenance of those machines. For example, some of the job opportunities that machines still require include programmers to code the functionalities of machines, technicians with technical skills for performing maintenance on those machines and digitally skilled people to operate and manage the production processes (Fiorelli 2018).

Theoretical Perspective

Anthony Giddens, a British sociologist, is responsible for developing and coining the term “structuration theory” and the first published work on shaping social reality. According to the structuration theory, individuals or “social forces” are essential factors that influence social transformation. We understand from Giddens’s statements (1979; 1984) that structuration is part and parcel of all social change.

The term “structures” from Giddens’s (1979) structuration theory are perceived as rules and resources (Alderson 2016). Social structures in more than one form have the possibility to serve as both enablers and restraints for human agents (Stoecklin and Fattore 2018). Therefore, in relation to this article, these social strata can engender divisions within society. South Africa needs to develop active policies and legislation that focus on reshaping the social strata that hold back unemployed youth from participating in the digital world.

According to Giddens (1984, 21), "... man actively shapes the world he lives in at the same time as it shapes him." This implies that the technological advances that emerge, and that are aligned with particular IRs, are shaped by people. People and their innovations contribute to the transformations that the universe continues to experience, regardless of how little the impact may be and, therefore, those changes also impact the entire society. The research undertaken by Symonds Brown and Lo Iacono (2017) agrees with Giddens (1984) and strengthens the structuration theory by stating that structuration theory is informed by human beings interacting with the world, which may be either enabling or limiting. The advances that transform society are largely due to the output of the interaction between individuals and the resources, objects or knowledge of this world. Therefore, this implies that interaction and reaction are at the centre of structuration theory. With the interaction between people and social structures, there is usually an expected reaction.

This article draws on some of the attributes from Giddens's structuration theory to highlight how the theory can make important contributions in terms of understanding how social strata can determine who benefits, or not, from the 4IR and the digital society.

In the same fashion, applying the structuration theory to the issue of youth unemployment in a digital world can help shape policies to address shortcomings—especially in a developing country such as South Africa.

Table 1 below illustrates how some of the aspects of the structuration theory relate to this article. Based on the structuration theory discussed in this section of the article, three components were identified as key: 1) social structures/forces; and 2) individuals (internal actors); or 3) individuals (external actors).

Table 1: Structuration theory aspects

Structuration theory component	Description	The context in which the theory relates to this article
Social structures/forces	Refers to resources that facilitate action to transform, and rules that govern a specific community.	Unemployed people from disadvantaged communities experience several barriers because of prevailing socio-economic conditions. These barriers are inadvertently created or accentuated by individuals when they enhance particular processes, innovate and/or introduce new technologies (for example, digital transformation). Therefore, even though such advances may provide efficacy and benefits to various levels of society, they may also disadvantage other levels or groups of individuals in society. Individuals may be disadvantaged because of a lack of adequate skills, their educational background, and lack of access to enabling resources. Digital advancements may thus transform society but the reality is unemployment for sections of society unable to adjust.
Individuals that engender change or advances: (internal actors)	Those (individuals or organisations) with resources who either knowingly or unknowingly cause a change by their actions that affect others in society.	Some individuals (or organisations) develop and facilitate change and advances that affect society as a whole. For example, people who are innovative and who are business-minded find ways to enhance business processes for services and products. Simultaneously, this may create obstacles or barriers for other people or levels in society. Frequently, those who are well educated or with access to resources reap the most benefits.
Individuals at the receiving end: (external actors)	External actors are those who are disadvantaged by the advances created by internal actors.	People who are most disadvantaged by technological advances and change—those unemployed and seeking opportunities in a society that is governed by rules that are created by the innovators (internal actors).

The structuration theory emphasises that individuals or organisations can trigger the shape of social strata, even though they may not be the conscious conceptions of the people introducing change. However, to enable a level playing field and prevent

widening inequalities in society, appropriate policies are required to manage transformations brought on by technological advances.

In another study with a similar contextual set-up, Russell, Simmons, and Thompson (2011), in their qualitative study that focused on understanding the lives of young people who were not economically active in England, found it fit to use the structuration theory. However, the application of the structuration theory has not been adequately captured in literature; hence its use in the analysis of the literature for this article.

The Current Review Article

The literature review shows that little attention has been placed on studies that explore how ICTs (associated with the 4IR) have impacted developing economies and whether standards of living have improved (Erumban and Das 2016). This review article, therefore, attempts to fill this identified gap in the literature by assessing how existing social strata in developing countries, specifically South Africa, may hinder many of the unemployed youth from becoming economically active in the digital transformation taking place in the workplace. The primary purpose of the review article is to demonstrate how social strata can result in new forms of division within society through the impacts resulting from the 4IR and the growth of digital transformation. The specific objectives of this review article are to:

- Highlight what has been researched in the literature around societal barriers to digital transformation and its contribution to higher levels of youth unemployment.
- Extend and contribute to the structuration theory within the literature on the persistence of especially youth unemployment in the 4IR era.

There are no clear answers to the above objectives because of limited research in this field. This paper, therefore, explores how social strata may in fact be responsible for who benefits—and who does not—from the impacts of the 4IR. Failure to realise the potential work opportunities and to provide an enabling 4IR environment and leverage support towards active participation in the digital society, may compromise the future livelihoods of many disadvantaged youths by further exacerbating existing divides in society. Most nations, but particularly those in the developing world, are faced with the complex issue of addressing high rates of youth unemployment. This requires policies to be adopted that will promote active economic participation amongst the youth in the digital society.

This qualitative article focuses on existing literature to draw findings around the structuration theory, social strata and the workplace transformations underway in the workplace. Comprehensive electronic searches were conducted to identify relevant articles systematically. The structuration theory was then applied to the broad findings in the literature to better understand the current situation and provide insights into future trends. Examining previous IRs in the literature helped provide context.

Discussion

Youth Unemployment: South Africa and the International Context

In this section, the review article provides an overview of the literature suggesting that unemployment among young people is widespread and becoming endemic in many countries, particularly in developing countries. While the 4IR may be creating new work opportunities, these appear to be fewer than the pace at which automation and other new technologies are making previous jobs obsolete.

The challenges of unemployment, poverty, poor living conditions and the digital divide remain ever present in South Africa. The South African context is thus described further below. Unemployment among young people in the age cohort of 15–24 years was 55.2% in the first quarter of 2019 (Statistics South Africa 2019). The intolerable growth in the high rate of youth unemployment continues to frustrate the government in South Africa. The statistical trends confirm that young people between the ages of 15 and 24 years are the most vulnerable in the national labour force. Reversing these trends will require policies that address inequalities embedded within social strata.

This trend is also the case internationally. In some European nations, such as Greece and Spain, almost half of the youth are unemployed (Eurostat 2021). Bruno et al. (2017) note that many European countries such as Greece, Italy and Spain continue to experience a high unemployment rate, while unemployment in Germany is on the decline. Most parts of Europe, however, have failed to ease the growing high levels of unemployment that have also been experienced on other continents. In parts of Europe there are countries with high unemployment levels among the working-age population, and a substantial fraction of those who are employed operate in shadow economic activities, as was indicated in a study carried out in Macedonia (Petreski, Mojsoska-Blazevski, and Bergolo 2017). However, countries like Germany have managed to decrease the rate of youth unemployment. The number of Germans aged between 15 and 24 years who were unemployed was recorded at 5.42% in 2019, whereas the percentage of Spain's youth aged between 15 and 24 years who were unemployed was recorded at 38.3%, and at 35.0% for Greece in the same period and age cohort during the same year (Eurostat 2021).

High youth unemployment rates in most European states negatively impact on the economy and pose a severe problem in terms of socio-economic policies meant to alleviate the problem (Isengard 2003). Similarly, Artner (2013) adds that youth unemployment is a serious problem and poses a severe threat to the future of young people in Europe. In addition to the issue of youth unemployment in Europe, Petreski et al. (2017) spell out that this weakens young people's potential to contribute actively to economic growth. In their study, Bruno et al. (2017) investigated the impact of the financial crisis on youth unemployment in the Organisation for Economic Cooperation and Development (OECD) countries and found that the issue was more problematic in Europe and affected young people entering the labour market in particular. Bruno et al.

(2017) maintained that (at that stage) unemployment rates in Europe were at what they called “pre-crisis levels” following the 2009 recession. Scholars have also deliberated on the real cause of the high rate of youth unemployment in Europe. Hasselbalch (2019) claims that the EU’s imbalance is driven by existing economic gaps and structural differences between the rich and poor countries in Europe. The decrease in demand for low-skilled jobs is the leading cause of youth unemployment, given that it is still the best opportunity for most youths who enter the workforce (Tåhlin and Westerman 2020). Petreski et al. (2017) are of the view that the cause of the high rate of youth unemployment is mainly the poorly managed transition between school and the workplace. In addressing the European Union (EU) skills shortage and increasing unemployment, Kapoor, Weerakkody, and Schroeder (2018) argue that the education system must be given more attention in Western Europe.

Skills Gap and Unemployment

The literature points out that various European countries continue to experience an increase in youth unemployment, despite a skills shortage (Cvecic and Sokolic 2018; European Commission 2020). Most literature from Europe tends to flag high unemployment as the result of the education system not preparing youths with the requisite skills demanded by the digital age. For example, Gregg (2001) states that unemployed youth with no prior work experience and relevant skills tend to have limited work opportunities, even when employment demand increases as economic conditions improve. Youth unemployment remains a global problem and has a negative effect on individuals, broader society and the economy.

In their report prepared for the Gauteng Province Premier’s Office in South Africa, Steyn Kotze et al. (2019) cite that most young people in the province do not have adequate access to the essential skills and services needed to enter the workplace. Most of the unemployed youth have low digital literacy, a skill that is required to navigate online services, they live in poverty and are burdened with poor socio-economic circumstances, and have little access to the internet and ICTs (Matli and Ngoepe 2021). Access to essential resources enabling them to participate actively in the 4IR digital economy thus remains essential for most young people.

According to the EU Commission (2020), there is a correlation between the high rate of unemployment and the skills shortage experienced in Europe. Kapoor et al. (2018) further add that the issues around skills shortages in the EU are because the current skills output is not correlated with the modern 4IR economy. The EU also acknowledges that the levels of youth unemployment experienced and the fact that the youth become discouraged from looking for work, are mainly due to the economic and structural challenges faced (European Commission 2020). Tåhlin and Westerman (2020) explain that the skills shortage is structural and twofold: firstly, the supply side that involves individual work experience and education and training; and, secondly, the demand side that entails what the job offerings in the workplace are looking for in the workforce in terms of education and years of experience. Tåhlin and Westerman (2020), in their study

on youth employment in Europe, used secondary data from 10 north-western European countries and found that the upgrading of digital skills and furthering education tailored for the 4IR are strongly associated with improving the chances of employment amongst the youth. Hasselbalch (2019) in his analysis contends that there is a direct relationship between Technical and Vocational Educational Training (TVET) and employment, and countries with a low unemployment rate have good TVET systems. Tåhlin and Westerman (2020) and Hasselbalch (2019) centre the problem of youth unemployment on acquiring the correct education and skills. This review article cautions that underlying social structures can also hinder young people from realising their full potential, particularly those from developing countries.

The South African National Digital and Future Skills Strategy emphasises the importance of providing appropriate digital skills so that citizens can reap the benefits flowing from the 4IR and become active participants in the digital economy. The whole of society must adopt and adapt to the digital world with respect to future generations (The Department of Communications and Digital Technologies 2020). The acquisition of a diversity of digital skills will enable these future generations to function within the 4IR, which is becoming dependent upon digital technologies.

The 4IR in South Africa

There are structural challenges that exist in many developing countries that prevent the take-off of the 4IR. The enabling infrastructure and other required resources are not sufficiently present in developing nations and do not equate to those found in developed countries, which as mentioned earlier, are still themselves struggling with imbalances that result in high youth unemployment. For example, the speed of internet connections and the ratio of skilled and educated workers are higher in developed nations than in developing ones. This structural challenge, amplified by the structuration theory, disadvantages South Africa as a developing nation from becoming competitive in the digital age. Hall and Maffioli (2008) add that the poor quality of appropriate education and lacking skills are among the factors that will delay the speed of adoption of the 4IR in developing nations. Therefore, this review article suggests that the challenges faced by developing countries when adapting to the 4IR, will likely be more complex than those experienced in more developed countries.

The 4IR and its impacts are relatively new and, therefore, there is much uncertainty and little knowledge yet about the real impact and the policies required to adapt to it. Many countries are trying to figure out how best to respond to the 4IR, while others are reforming their education and economic systems to adapt to the digital era. This might widen the divides and inequalities that already exist between states, organisations, and sections of society. The impacts of the 4IR are increasingly researched in developed countries, but there is as yet limited literature about the impacts on developing countries.

The 4IR and Employment

At present, it is still unclear from the literature what type of jobs are more likely to be negatively affected by the advances of the 4IR. Picatoste et al. (2018) and Perez, Alonso and Lopez (2015) agree that low-skilled or manual jobs in general are most likely to be affected. It is expected that new technologies will replace many low-income and low-skilled jobs (Picatoste et al. 2018). In most cases, jobs held by low-skilled workers are matched with low-income salaries. Also, people who are lower paid workers tend to be more vulnerable to skills exclusion at work (Hendry 2000). The number of skilled and semi-skilled people employed between 1980 and 2005 (in Spain) from 24 production companies sampled was higher than those who were low-skilled, which fell by 33% during the same period (Perez et al. 2015). New jobs created for skilled people in Spain has risen, compared to a decrease in jobs available for low-skilled people. Low-skilled workers with no digital skills are being substituted by skilled workers familiar with new technology and equipment resulting from the adoption of ICTs (Perez et al. 2015). The adoption of ICTs has seen jobs categorised as low skilled being replaced by either internal operational processes (performed by the computing machines) or new jobs performed by skilled employees who are familiar with the new technologies and machines. Fiorelli (2018) argues, however, that those semi-skilled jobs that are tied to routine processes are on the decrease, whereas the numbers of both high and low-skilled jobs are rising because non-routine processes are now being followed.

The digital economy will create new jobs requiring people with a diverse subset of skills and knowledge in certain areas (Nam 2019). Its impacts will likely be mixed amongst skilled and non-technical workers. History is showing that the advances made in ICTs have created many new jobs compared to those that they have taken away (Berg, Buffie, and Zanna 2018). Whatever transpires, is that the employment market will undergo major shifts. This “ticking-bomb” will likely affect non-technical and low-skilled workers the most and there is a need to retrain this cohort with new skills. Investment in the re-education of workers is important, as is the requirement to continuously upskill workers with digital knowledge and skills (Berg et al. 2018). Education will be a key driver in ensuring that people remain relevant in the workplace.

There are various skills that have been identified as essential for the 4IR. For example, Picatoste et al. (2018) state that digital competencies and varying technological skills are critical for the digital age. The education system has an essential role to play in preparing society for the 4IR. Education and training institutions will need to revise their curricula to ensure that society is prepared for the impacts of globalisation and the digital economy (Picatoste et al. 2018). It is essential that citizens and the youth are given a second chance to acquire relevant skills and quality education so that society is equipped to meet the needs of the 4IR. Skills will need to match the new operations and processes of doing business in the digital age. Policies must address job creation issues; this requires an adequate analysis of the impact the 4IR will have on current low and semi-skilled jobs. There is a need to develop policies that will provide interventions that support the creation of new jobs matched to new ways of doing business. Workers who

are retrenched due to being replaced by machines, often experience difficulties integrating back into the job market because of the new or unconventional skills that have become a necessity (Fiorelli 2018).

Limitations of the Study

This study is not exempt from its limitations. Firstly, the qualitative approach employed secondary data from document reviews rather than new data from surveys. Follow-up studies can be enriched by using primary data. Secondly, quantitative reporting on findings, discussions and debates will strengthen these conclusions. The article emphasises that it does not attempt to address the context of the multifaceted perspectives around the 4IR and its impact on employment. Rather, its focus is solely on how social structures and socio-economic factors are key drivers in the current high levels of youth unemployment in the age of the 4IR.

Conclusions and Recommendations

This review article aims to contribute to the growing interest and research in seeking to understand the 4IR and the digital transformations underway, while managing the current high rates of unemployment, especially regarding youth unemployment. Firstly, this article aims to contribute to the international literature on the impacts of the 4IR and the digital age on unemployment. Secondly, it employs structuration theory to highlight how social strata and socio-economic factors can hinder people from becoming active participants in the digital economy. The article finds that there is a necessity to formulate crucial policy measures and interventions to ensure that society, and youth in particular, can participate in the opportunities presented by the 4IR, and that no one is left behind in the digital economy. Society must embrace the 4IR and the challenges and the opportunities it presents. This requires all stakeholders—government, business, the education sector and communities—to become more effective in their response to the 4IR. A key area will be equipping people with the right skills and knowledge to respond to the transformations being experienced.

The article found little consensus from the literature review that technological advances across the last 250 years have reduced the demand for labour, although the operational processes followed (and skills required for those processes), have changed. The article also contributes to the emerging literature on the impact of the 4IR on the demand for labour from a developing country's perspective. There is much scope to expand on this aspect, and how developing nations can become active players and benefit from the opportunities provided by the 4IR. The literature review on the 4IR and its effect on employability suggests that it may be premature to draw a conclusion, as countries are still adapting to changes and experiencing the impacts in different ways and at different speeds. What is evident, is that inequalities among and within countries in the world may be widened and accelerated.

The article highlights the critical issue of creating an enabling environment for active participation in the 4IR. The effect on jobs and society in general is now part of an ongoing international discussion. There remains a body of opinion that the 4IR is causing unemployment and widening inequality. New policies and recommendations are required to address such impacts and determine a way forward for countries like South Africa, with already stark inequalities. In the South African context, it is worth noting that inequalities in technology infrastructure distribution and digital access may be further harming those already living in disadvantaged communities.

Policies will need to target the unemployed youth. There is an urgent need to revisit education and training systems to ensure that they prepare people for the future world of work. The 4IR is likely to create new types of jobs, and the positive impacts will be felt more by those who have been adequately trained to understand the digital age, rather than those who have only been exposed to current education levels (Teng et al. 2019). However, the issue of appropriate skills is key for the 4IR, rather than standard educational levels. In China, many graduates are securing low-paid or part-time jobs because this group lacks the technological and digital skills required in the marketplace (Teng et al. 2019). Post-school education has a major responsibility to address this situation. Companies must also provide continuous training and education opportunities to stay relevant as the workplace transforms.

Many countries, including developed nations, are faced with the challenges of high levels of youth unemployment, some of which can be attributed to the fallout of the 4IR. There is also a general acceptance that youth need to be adequately educated and trained to meet the skills requirements of the 4IR. What requires more attention in developing countries, however, is how to respond to the situation within a society already challenged by wide inequalities. This is where structuration theory can help to better understand the challenges and to adapt policies to meet those challenges.

Several practical implications for stakeholders involved with economic development, job creation, education and training, business, and employment can also be drawn from this article. Through a better understanding of the socio-economic conditions and social strata prevailing in a country, especially those in developing countries, policies can be better developed and targeted to ensure a more inclusive response to the challenges posed by the 4IR, in particular the rolling out of ICTs and the provision of digital access, education and training. Therefore, further research on understanding the 4IR and its impacts will inform policy implementation, so that funding can be channelled appropriately to enhance the benefits of the 4IR and soften its negative impacts on employment.

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