ARTICLES

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THE FOURTH INDUSTRIAL REVOLUTION AND UNEMPLOYMENT IN SOUTH AFRICA: A CONTINUING CHALLENGE

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Abstract. *This article explores the interplay between South Africa's persistent unemployment issue and the Fourth Industrial Revolution (4IR). Characterized by advanced technologies like Artificial Intelligence (AI), the Internet of Things (IoT), robotics and automation, the 4IR shapes industries and work dynamics, bringing both potential and challenges for employment. Amid South Africa's historical unemployment struggles, the article examines the 4IR's impact on the labor market and strategies to address this complexity. The 4IR presents a twofold impact on employment in South Africa. Automation displaces traditional jobs, notably in manufacturing and agriculture, intensifying concerns about job losses. Concurrently, evolving skill demands leave many workers unprepared for roles in emerging fields, exacerbating the existing skills gap and socio-economic inequalities. Nonetheless, the 4IR offers avenues to counter unemployment. Vital reskilling and upskilling initiatives are emerging to equip the workforce with relevant 4IR-related skills. Investing in training programs can ease workforce transitions and mitigate automation's adverse effects. Furthermore, nurturing entrepreneurship and supporting small and medium-sized enterprises (SMEs) can stimulate economic diversification and create employment opportunities, fostering a more resilient labor market. To navigate 4IR challenges, proactive measures are crucial. Government policies promoting technology integration, innovation, and workforce development can drive sustainable growth and job creation. Ensuring digital inclusivity is also vital, in bridging the technological divide. In essence, the intricate 4IR-unemployment relationship presents diverse challenges and opportunities.*

By cultivating an adaptable workforce, fostering entrepreneurship, and implementing strategic policies, South Africa can tackle the ongoing challenge of unemployment while harnessing the transformative potential of the Fourth Industrial Revolution.

Keywords: *fourth industrial revolution, unemployment, labor market, automation, reskilling and upskilling, economic diversification.*

1. INTRODUCTION

The intertwining narratives of technological progress and unemployment have shaped the modern global economy, and nowhere is this intricate interplay more pronounced than in the context of South Africa. The advent of the Fourth Industrial Revolution (4IR), characterised by the fusion of digital, physical, and biological technologies, has thrust the nation into a new era of innovation and disruption[1]. Simultaneously, the longstanding challenge of unemployment[2], deeply ingrained in South Africa's socio-economic fabric, continues to cast a shadow on its developmental aspirations. This article delves into the intricate interplay between the 4IR and unemployment in South Africa, dissecting the multifaceted dynamics that have emerged and exploring potential strategies to address this persistent issue.

The 4IR, heralded by innovations such as artificial intelligence, automation, and the Internet of Things, has brought about unprecedented transformations in industries across the globe[3]. This technological wave has the potential to amplify productivity, improve efficiency, and reshape traditional job roles. In South Africa, a nation with a history marked by both resilience and inequality[4], the impact of the 4IR is particularly pronounced. As the nation endeavours to navigate its post-apartheid socio-economic landscape, the challenge of unemployment[5] looms large, characterised by staggering rates that disproportionately affect the youth and historically marginalised populations.

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[1] *Mokofe W. M.* The Changing World of Work and Further Marginalisation of Workers in South Africa: An Evaluation of the Relevance of Trade Unions and Collective Bargaining, Comparative, and International Law Journal of Southern Africa, 2021, 54(2). p. 1–39.

[2] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

[3] *Mokofe W. M. and van Eck S.* Reflections on Marginalised Workers and the Role of Trade Unions in the Changing World of Work, Industrial Law Journal, 2021, 41(3). p. 1365–1389.

[4] *Stoltz E.* South Africa remains most unequal country, World Bank Report finds // mg.co.za: [Electronic resource]. — URL: https://mg.co.za/news/2022-03-10-south-africa-remains-most-unequal-country-world-bank-reportfinds/ (date of address: 28.02.2024).

[5] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

Historical challenges in the labour market, intricately intertwined with apartheid-era inequalities, are now intersecting with the disruptive forces of the 4IR. This confluence has ignited a debate that oscillates between anticipation and apprehension. On one hand, there is optimism that the technological surge could yield innovative solutions to long-standing problems, creating opportunities for novel industries and reimagined job roles[1]. On the other hand, concerns deepen about the potential exacerbation of unemployment as automation replaces manual labour and the swift pace of technological evolution outpaces the capacity of the workforce to adapt[2].

The impact of the 4IR on employment is far from uniform. Certain sectors, such as manufacturing, logistics, and service industries, are experiencing profound transformations[3]. Traditional jobs that were once the bedrock of livelihoods are now being substituted by advanced technologies that demand new skill sets. This transition is accompanied by a persistent skills mismatch[4], where the capabilities of the workforce lag behind the demands of the evolving job market. Consequently, a stark divide emerges between individuals equipped to seize 4IR-related opportunities and those left grappling with obsolete skills.

In light of these challenges, there is a growing recognition of the need for proactive strategies to address the complex interplay between the 4IR and unemployment. This involves fostering an environment that encourages reskilling and upskilling initiatives[5], cultivating entrepreneurship, and creating a policy framework that aligns technological advancement with inclusive economic growth. Furthermore, the quest for digital inclusivity, ensuring that all members of society have access to the tools and resources of the digital age, becomes paramount to bridging the gap that the 4IR might inadvertently deepen.

As South Africa stands at the crossroads of technological innovation and persistent unemployment, the nation faces a pivotal juncture in its developmental

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[1] *Miruna G.* The Future Of Technology: Investors Share Reasons To Be Optimistic // www.forbes.com: [Electronic resource]. — URL: https://www.forbes.com/sites/mirunagirtu/2023/06/27/the-future-of-technology-investors-share-reasons-to-be-optimistic/?sh=691859dba539 (date of address: 28.02.2024).

[2] *Harry J. H.* Understanding the impact of automation on workers, jobs, and wages // www.brookings.edu: [Electronic resource]. — URL: https://www.brookings.edu/articles/understanding-the-impact-of-automation-on-workers-jobs-and-wages/ (date of address: 28.02.2024).

[3] *Serumaga-Zake J. M. and van der Poll J. A.* Addressing the Impact of Fourth Industrial Revolution on South African Manufacturing Small and Medium Enterprises (SMEs), Sustainability, 2021, 13(21). 31 p.

[4] Lost, Job gained: What the future of work will mean for jobs, skills, and wages // www.mckinsey.com: [Electronic resource]. — URL: https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages (date of address: 28.02.2024).

[5] *Li L.* Reskilling and Upskilling the Future-ready Workforce for Industry 4.0 and Beyond Information Systems Frontiers, 2022, p. 1–16.

trajectory. The ensuing exploration of the intricate dynamics and potential solutions in the following sections seeks to illuminate a path forward in harnessing the transformative potential of the 4IR while addressing the ongoing challenge of unemployment that has been etched into the fabric of the nation's economic and social landscape.

2. CHALLENGES TO EMPLOYMENT IN SOUTH AFRICA

The challenges to employment in South Africa are multifaceted and intricately linked to the Fourth Industrial Revolution (4IR). Automation and digitalisation pose a risk of job displacement, particularly in sectors like manufacturing, agriculture, and services, as routine tasks become automated[1]. This technological evolution contributes to a skills mismatch, where the rapid pace of change outpaces workers' ability to acquire new skills, exacerbating unemployment. Inequality is another concern, as the 4IR has the potential to widen the gap between skilled and unskilled workers, deepening existing economic disparities. Additionally, the country's large informal economy is vulnerable to disruptions caused by the 4IR, potentially leading to job losses and underemployment. These pivotal challenges are examined in the following sections.

Job displacement: At the core of South Africa's economic transformation, the Fourth Industrial Revolution (4IR) introduces a paradox: while it offers promises of unprecedented technological advancements and innovation, it also ushers in an era of job displacement that could have far-reaching ramifications for the country's workforce. At the forefront of this challenge lies the disruptive force of automation and digitalisation, which are systematically reshaping the nature of work in sectors ranging from manufacturing and agriculture to service industries.

As the mechanized fingers of automation progressively reach deeper into the tapestry of industries, jobs that have been traditionally performed by humans are now being outsourced to machines, algorithms, and robots. This phenomenon is particularly pronounced in sectors that have historically formed the bedrock of South Africa's economy.

Manufacturing, once a thriving sector employing a substantial portion of the labour force, is witnessing a profound transformation[2]. Assembly lines once manned by scores of workers are now populated with robotic arms and

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[1] *Alexander R.* Key Opportunities and Challenges for 4IR in South Africa. SARChI Industrial Development Working Paper Series. 2021. 63 p.

[2] *Hanusch M.* Why South African manufacturing is under pressure (and what to do about it) // blogs.worldbank.org: [Electronic resource]. — URL: https://blogs.worldbank.org/africacan/why-south-african-manufacturing-under-pressure-and-what-do-about-it (date of address: 28.02.2024).

advanced machinery, performing tasks with unrivalled precision and efficiency. The consequence is a looming displacement of jobs that were once considered secure and sustainable[1].

Agriculture, another sector intrinsic to South Africa's identity, confronts a parallel challenge. The fields that have long been tilled by human hands are now being navigated by autonomous tractors and drones, streamlining operations, and boosting yields[2]. While this technological revolution promises enhanced productivity and agricultural sustainability, it simultaneously casts shadows of uncertainty over the livelihoods of those whose hands have nurtured the soil for generations[3].

Even within service industries, the impact of automation is unmistakable. Customer service operations are being revolutionised by chatbots and virtual assistants, while cashier-less checkout systems are changing the face of retail[4]. Routine and repetitive tasks, once reliant on human intervention, are now being handed over to algorithms and machines that can process data at lightning speed, leading to a significant reduction in human labour requirements.

The risk of job loss due to technological advancements is not confined to a specific sector; it extends across industries and reverberates throughout the economy. While the benefits of automation are undeniable — increased efficiency, reduced errors, and potentially lower costs — the unsettling consequence is that numerous workers find their roles in jeopardy[5]. The stability and security that employment once provided are being destabilised by the march of automation and digitalisation.

As South Africa grapples with this multifaceted challenge, it is crucial to acknowledge the complexities it brings. The displacement of jobs due to automation is not a monolithic phenomenon; it varies based on the nature of the

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[1] The future of Jobs reports 2020. World Economic Forum. October, 2020. 163 p.

[2] *Phillips L.* Machinery trends defining the future of farming // www.farmersweekly.co.za: [Electronic resource]. — URL: https://www.farmersweekly.co.za/agri-technology/machinery-and equipment/machinery-trends-defining-the-future-of-farming/ (date of address: 28.02.2024).

[3] *Bell T.* Make way for robots in the sky: How drones are transforming farming in South Africa // www.dailymaverick.co.za: [Electronic resource]. — URL: https://www.dailymaverick.co.za/article/2021-11-09-make-way-for-robots-in-the-sky-how-drones-are-transforming-farming-in-south-africa/ (date of address: 27.02.2024).

[4] *Weitzman T.* Understanding The Benefits And Risks Of Using AI In Business // www.forbes.com: [Electronic resource]. — URL: https://www.forbes.com/sites/forbesbusinesscouncil/2023/03/01/understanding-the-benefits-and-risks-of-using-ai-in-business/?sh=62d2ce866bba (date of address: 28.02.2024).

[5] *D'Cruz P., Du S., Noronha E., Praveen P., Trittin U. and Whelan G.* Technology, Megatrends and Work: Thoughts on the Future of Business Ethics, Journal of Business Ethics, 2022, vol. 180, p. 879–902.

work, the adaptability of the workforce, and the overall economic environment. The responsibility lies not only in acknowledging the inevitability of change but also in proactively charting a course that embraces this change while ensuring the well-being and resilience of the nation's workforce[1]. The path forward involves a careful balance between embracing technological progress and developing strategies that mitigate the negative impacts of job displacement, ultimately leading to a more inclusive and adaptable labour market in the face of the Fourth Industrial Revolution.

Skills Mismatch: The rapid pace of technological change often outpaces the ability of the workforce to acquire new skills. Many South Africans may find themselves lacking the skills[2] necessary to participate in emerging industries, exacerbating unemployment. As the wheels of progress in the Fourth Industrial Evolution (4IR) turn relentlessly, the South African workforce stands at a critical juncture. The rapid evolution of technology, driven by the convergence of artificial intelligence, automation, and digitalisation, brings forth a burgeoning challenge: the gaping chasm between the pace of technological change and the workforce's capacity to acquire new skills. This phenomenon, known as the skills mismatch[3], has profound implications for South Africa's employment landscape, potentially exacerbating unemployment and widening the socio-economic divide.

In a world where technology is advancing at an unprecedented pace, the half-life of skills is rapidly diminishing. What was considered cutting-edge knowledge yesterday can quickly transform into outdated information today. This dynamic poses a significant challenge to a nation's workforce, especially when the ability to adapt and learn new skills becomes paramount for sustained employability. The rapid adoption of automation, machine learning, and data analytics across industries introduces a demand for a skill set that transcends traditional boundaries.

South Africa, like many other countries, grapples with the question of how to bridge the gap between the skills of today and the skills of tomorrow. The foundation of this dilemma lies in the inertia of education systems and training programs, which often struggle to keep up with the pace of technological evolution. As industries metamorphose and create new job roles, the existing workforce might find itself ill-equipped to step into these positions due to a dearth of relevant skills. This not only

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[1] *Padayachee R. and Verena P.* AI will transform Jobs — but Workforce transformation is up to you // www.pwc.co.za: [Electronic resource]. — URL: https://www.pwc.co.za/en/press-room/ai-will-transform-jobs-but-workforce-transformation-is-up-to-you.html (date of address: 28.02.2024).

[2] *D'Cruz P., Du S., Noronha E., Praveen P., Trittin U. and Whelan G.* Technology, Megatrends and Work: Thoughts on the Future of Business Ethics, Journal of Business Ethics, 2022,vol. 180, p. 879–902.

[3] *Pater R., Cherniaiev H. and Marcin K.* A dream job? Skill demand and skill mismatch in ICT, Journal of Education and Work, 2022, 35(6). p. 641–665.

stalls career progressions but also hinders the nation's ability to remain competitive in a global economy that thrives on innovation and adaptability.

The skills mismatch compounds the pre-existing challenges in South Africa's labour market[1]. Historically marginalised communities and individuals with limited access to quality education are disproportionately affected[2]. As emerging industries demand specialised technical skills, a significant portion of the workforce risks being left behind, trapped in an unemployment cycle perpetuated by the gap between demand and supply in the job market[3].

Addressing the skills mismatch is not a singular endeavour but rather a multi-pronged strategy that requires collaboration between educational institutions, the private sector, and government entities[4]. Fostering a culture of lifelong learning is paramount, encouraging individuals to continuously upskill and reskill to remain relevant in a rapidly changing landscape. Moreover, forging partnerships between academia and industry can lead to the development of curricula[5] that are responsive to the evolving demands of the job market.

South Africa's approach to addressing the skills mismatch will determine its ability to harness the transformative potential of the 4IR while avoiding the pitfalls of an increasingly polarised workforce. By investing in targeted training programs, promoting digital literacy, and embracing a proactive mindset towards skill acquisition, the nation can pave the way for a workforce that is not only adaptable to technological change but also equipped to thrive in an era characterised by innovation.

The outcome hinges on the nation's ability to bridge the divide between the rapidly advancing world of technology and the reskilled, upskilled, and agile workforce it demands.

Inequality and the potential widening of socioeconomic rifts: The 4IR has the potential to widen the gap between skilled and unskilled workers, as those with

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[1] *Khuluvhe M., Bhorat H., Oosthuizen M. [et al.].* Skills demand and supply in South Africa. Labour Market Intelligence research programme, 2022. 36 p.

[2] *Grant S.* Access to Education: The Impact Of Inequality On Education / S. Grant // www.graygroupintl.com: [Electronic resource]. — URL: https://www.graygroupintl.com/blog/access-to-education (date of address: 28.02.2024).

[3] *Kenton W.* Structural Unemployment: Definition, Causes, and Examples // www.investopedia.com: [Electronic resource]. — URL: https://www.investopedia.com/terms/s/structuralunemployment.asp (date of address: 28.02.2024).

[4] *Brown A.* 4.9 million young people are unemployed — addressing the skills mismatch could help 2023 // www.iol.co.za: [Electronic resource]. — URL: https://www.iol.co.za/business-report/careers/49-million-young-people-are-unemployed-addressing-the-skills-mismatch-could-help-b1d26aed-2ebe-422e-ad4e-96ce7836c9a7 (date of address: 27.02.2024).

[5] *Howells M.* Fostering a culture of lifelong learning // www.astrazeneca.com: [Electronic resource]. — URL: https://www.astrazeneca.com/media-centre/articles/2023/fostering-culture-lifelong-learning.html (date of address: 28.02.2024).

relevant skills are better positioned to benefit from the new opportunities. This could further deepen existing economic inequalities in the country.

The advent of the Fourth Industrial Revolution (4IR) ushers in a wave of transformative technological innovations that have the potential to reshape economies, industries, and societies worldwide. However, beneath the veneer of progress lies a profound concern: the specter of deepening inequality. The 4IR's seismic shifts in job requirements and labour dynamics pose the risk of exacerbating the divide between skilled and unskilled workers, amplifying existing economic inequalities in a nation grappling with historical disparities.

At its core, the 4IR is marked by the ascent of technologies such as artificial intelligence, automation, and advanced data analytics. These innovations are ushering in a new era of productivity, efficiency, and connectivity, creating novel opportunities for economic growth and innovation. Yet, the distribution of the benefits arising from these advancements is far from equitable. As industries pivot towards digitisation and automation, the demand for specialised skills intensifies, creating a premium for individuals who possess the ability to navigate the complex web of 4IR-related competencies. Amid this technological transformation[1], a significant concern emerges — the potential widening of the gap between individuals possessing the necessary skills and those who are deficient in them. Skilled workers, possessing the expertise to harness the potential of the 4IR, are better positioned to benefit from the burgeoning job opportunities that these advancements bring forth. Conversely, individuals who lack access to quality education, training, and the means to acquire 4IR-related skills may find themselves relegated to a realm of diminishing employment prospects. This discrepancy can set the stage for a bifurcated labour market, where a growing chasm separates those who prosper from those who languish.

South Africa, a nation with a history steeped in inequality due to its apartheid legacy[2], is particularly vulnerable to the exacerbation of existing disparities. The gap between historically marginalised populations and the privileged is one that the nation has been working tirelessly to bridge[3]. However, the 4IR's potential to disproportionately benefit those who are already equipped with resources and education could undermine these efforts. The lack of access to quality education,

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[1] UNCTAD. Technology and Innovation Report 2021. Catching technological waves. Innovation with equity. UNITED NATIONS, Geneva, 2021. 196 p.

[2] World Bank. South Africa Economic Update: South Africa's Labor Market Can Benefit from Young Entrepreneurs, Self-Employment // www.worldbank.org: [Electronic resource]. — URL: https://www.worldbank.org/en/country/southafrica/publication/south-africa-economic-update-south-africa-s-labor-market-can-benefit-from-young-entrepreneurs-self-employment (date of address: 28.02.2024).

[3] See the Employment Equity Act 55 of 1998.

particularly in disadvantaged communities, can perpetuate cycles of intergenerational poverty, further entrenching existing economic disparities[1].

The economic implications of this inequality are manifold. A workforce that is divided along the lines of technological readiness risks fragmenting economic productivity, hindering the nation's capacity to compete on a global scale[2]. Furthermore, the amplification of economic inequalities can strain social cohesion, fostering feelings of disenfranchisement and societal discord.

Mitigating the potential for inequality escalation necessitates a multifaceted approach. Investments in education that prioritise digital literacy and 4IR-relevant skills are essential to ensuring that all segments of society can actively participate in the evolving economy. Policies that promote equitable access to technology, training, and economic opportunities can go a long way in levelling the playing field. Collaboration between the public and private sectors can facilitate job creation and the cultivation of a workforce that is poised to thrive in the age of automation[3].

The 4IR's potential to both uplift and stratify societies underscores the importance of proactive intervention. By crafting strategies that prioritise inclusivity, equity, and access, South Africa can harness the potential of the technological revolution to forge a more equitable future. Failure to address the potential deepening of economic inequalities could impede progress, perpetuating historical divides and undermining the nation's ability to navigate the complex currents of the Fourth Industrial Revolution.

The Vulnerability of South Africa's Informal Economy: South Africa's large informal economy estimated at 3.3 million micro and informal businesses which are engaged in informal economy is particularly vulnerable to the disruptions caused by the 4IR[4]. Many informal sector jobs could become obsolete, potentially pushing more people into unemployment or underemployment[5]. In the mosaic of South Africa's economic landscape, the informal economy occupies a significant and intricate space. It is a realm where individuals strive to carve out livelihoods in the

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[1] *Ngqambela N.* South Africa must bridge digital divide to best benefit from 4IR // mg.co.za: [Electronic resource]. — URL: https://mg.co.za/thoughtleader/opinion/2022-11-10-south-africa-must-bridge-digital-divide-to-best-benefit-from-4ir/ (date of address: 28.02.2024).

[2] *Cherif R. and Fuad Hasanov F.* Competition, Innovation, and Inclusive Growth. International Monetary Fund, 2021. 28 p.

[3] OECD. A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy. International labour office Geneva, November, 2010. 48 p.

[4] MasterCard. South Africa's informal economy shows signs of movement to switch away from cash // www.mastercard.com: [Electronic resource]. — URL: https://www.mastercard.com/news/eemea/en/newsroom/pressreleases/pressreleases/en/2023/may/south-africa-s-informal-economy-shows-signs-of-movement-to-switch-away-from-cash/ (date of address: 28.02.2024).

[5] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

absence of formal employment structures[1], often driven by necessity and the spirit of entrepreneurship. Yet, against the backdrop of the Fourth Industrial Revolution (4IR), this sector faces unprecedented challenges that have the potential to reshape its dynamics, magnifying the vulnerability of those who have found solace in its informal embrace.

The 4IR, characterised by the rapid convergence of technology and data-driven advancements, heralds a new era of productivity and connectivity. However, as technology marches forward, it casts an uncertain shadow over the traditional roles and functions of the informal economy. This sector, which encompasses activities ranging from street vending and artisanal crafts to unregistered service providers[2], thrives on the intimate interplay between human labour and local communities. Yet, with automation, digital platforms, and e-commerce becoming increasingly prevalent, the ground beneath the informal economy quivers with potential disruption.

South Africa's informal economy is vast and diverse, often serving as a safety net for those excluded from formal labour markets[3]. However, the informal sector is particularly susceptible to the disruptive forces of the 4IR. The very characteristics that define this sector—flexibility, adaptability, and often minimal technological integration—can render it ill-equipped to navigate the challenges posed by automation and digitisation. Jobs that once provided steady income and stability are at risk of becoming obsolete, as technology-driven alternatives emerge that promise greater efficiency and convenience.

The implications of this potential upheaval are multifaceted. Individuals who depend on informal sector activities for their livelihoods might find themselves caught in a disconcerting cycle. The dwindling demand for traditional informal services could push many into unemployment or precarious underemployment, entrenching socio-economic challenges that South Africa is striving to address. Moreover, as the informal economy is often a refuge for marginalised communities, the potential erosion of its viability could exacerbate existing inequalities, widening the chasm between haves and have-nots[4].

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[1] World Bank. What is the Informal Economy // www.imf.org: [Electronic resource]. — URL: https://www.imf.org/en/Publications/fandd/issues/2020/12/what-is-the-informal-economy-basics (date of address: 28.02.2024).

[2] SME South Africa. Formal and informal business in South Africa // smesouthafrica.co.za: [Electronic resource]. — URL: https://smesouthafrica.co.za/formal-and-informal-business-insouthafrica/#:~:text=A%20large%20portion%20of%20the,and%20services%20at%20affordable%20prices (date of address: 28.02.2024).

[3] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

[4] ILO. Inequalities and the world of work, 2021 [Electronic resource]: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/relconf/documents/meetingdocument/wcms_792123.pdf.

Navigating this treacherous terrain demands a nuanced and forward-looking approach. Strategies must be devised to empower individuals within the informal economy to adapt to the technological winds of change[1]. This could involve fostering digital literacy, creating platforms that enable the informal sector to integrate with digital marketplaces, and offering training to equip participants with skills that align with 4IR demands. Additionally, the government, private sector, and civil society need to collaborate in crafting policies that acknowledge the informal economy's role, its vulnerabilities, and its potential to contribute to the nation's overall economic resilience.

The path forward is fraught with challenges, but also teeming with possibilities. Embracing the potential of technology to augment rather than replace informal sector activities is a critical step. By nurturing an environment where the informal economy can coexist harmoniously with the unfolding 4IR, South Africa can create a future where its most vulnerable citizens are not left behind in the rush of technological progress. As the informal sector faces disruption, it is the nation's responsibility to ensure that this transformation is one of empowerment, adaptability, and inclusive growth.

3. OPPORTUNITIES FOR ADDRESSING UNEMPLOYMENT

Investing in training programs and educational initiatives that focus on digital skills and 4IR-related competencies particularly the youth with the data from Statistics South Africa, which shows that the total number of unemployed youth stands at 4.9 million[2] can help workers transition into new roles and industries[3]. In the era of the Fourth Industrial Revolution (4IR), where the digital frontier expands with each passing moment, a beacon of opportunity shines amidst the challenges of unemployment. South Africa's unemployment rate in the first quarter of 2023 was recorded at 32.9% and is among the highest in the world[4]. This beacon is none other than the transformative power of reskilling and upskilling—a dynamic duo of strategies poised to bridge the gap between the skills of yesterday and the demands of tomorrow. For a country like South Africa, where historical employment

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[1] *Walker J. H. and Tebbutt E.* The informal economy as a provider of assistive technology: Lessons from Indonesia and Sierra Leone, Health Promotion International, 2023, 38(2). p. 1–10.

[2] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

[3] *Allen C., Asmal Z., Bhorat H. [et al.]*. Employment creation potential, labor skills requirements, and skill gaps for young people: A South African case study. 2021 University of Cape Town, Development Policy Research Unit. 83 p.

[4] *Rogan M. and Skinner C.* The nature of the South African informal sector as reflected in the quarterly labour-force survey, 2008–2014, REDI3x3 Working Paper 28 University of Cape, 2017. 33 p.

disparities and the waves of the 4IR converge, investing in reskilling and upskilling initiatives emerge as a pivotal means to usher individuals into new roles, and industries, and a future fraught with promise[1].

The essence of reskilling and upskilling lies in the profound recognition that learning is an ongoing journey. As traditional job roles undergo metamorphosis and new fields emerge, the capacity to adapt becomes a coveted asset[2]. Reskilling, the process of acquiring entirely new skills that align with evolving job requirements, empowers individuals to pivot their careers in response to dynamic market demands. Upskilling, on the other hand, involves enhancing existing skills to align them with the latest technological advancements.

In the South African context, reskilling and upskilling offer a lifeline to those who might otherwise find themselves cast adrift by the 4IR's disruptions. As industries undergo transformation and automation redefines work processes, individuals with the ability to traverse this technological terrain are poised to reap its rewards[3]. By investing in training programs and educational initiatives that equip individuals with digital skills and 4IR-related competencies, South Africa has the opportunity to create a workforce that not only survives but thrives amidst the waves of change.

The ripple effects of reskilling and upskilling extend beyond individual empowerment. By nurturing a workforce that can adapt and contribute to the 4IR-driven economy, South Africa enhances its competitiveness on the global stage. Emerging industries hungry for specialised talents can find a ready supply of skilled workers, stimulating economic growth and fostering innovation. Furthermore, this strategy can play a pivotal role in narrowing the skills gap, thereby reducing unemployment and the accompanying economic and social disparities.

However, the journey toward reskilling and upskilling is not without its challenges. Traditional notions of education, training, and skill development must evolve to accommodate the rapid pace of technological advancement[4]. The curriculum must be agile, reflecting the dynamic nature of the job market and the skills it demands. Collaboration between educational institutions, industry leaders, and policymakers is crucial in developing programs that are both relevant and responsive.

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[1] *Twinomurinzi H. Msweli N. and Mawela T. (eds.).* Digital Skills // EPiC Series in Education Science, 2022, vol. 4. p. 88–101.

[2] *Brush K.* What is upskilling and Why is it important // www.techtarget.com: [Electronic resource]. — URL: https://www.techtarget.com/whatis/definition/upskilling (date of address: 27.02.2024).

[3] *Perifanis N. A., Kitsios F.* Investigating the Influence of Artificial Intelligence on Business Value in the Digital Era of Strategy: A Literature Review, Information 2023, 14(2). 30 p.

[4] *Li L.* Reskilling and Upskilling the Future-ready Workforce for Industry 4.0 and Beyond Information Systems Frontiers, 2022, p. 1–16.

Moreover, the inclusivity of these opportunities is paramount. Ensuring that individuals from all walks of life, including historically marginalised communities, have access to reskilling and upskilling initiatives is an imperative step in fostering a truly inclusive workforce. Efforts to make these programs accessible, affordable, and tailored to individual needs can create a more equitable path toward economic empowerment.

As South Africa navigates the crossroads of the 4IR and its employment challenges, reskilling and upskilling stand as a beacon of hope—a means to transcend the limitations of the present and embrace the potential of the future. By embracing these strategies, the nation can pave the way for a more resilient and adaptable workforce, one that thrives in the face of technological disruption and becomes a driving force in shaping the contours of the Fourth Industrial Revolution.

Encouraging entrepreneurship and supporting small and medium-sized enterprises (SMEs) can foster job creation and economic diversification, while also promoting innovation in emerging sectors[1]. In the intricate interplay between unemployment and economic growth, entrepreneurship and innovation emerge as dynamic partners, capable of orchestrating a symphony of change. As the Fourth Industrial Revolution (4IR) sweeps across industries, South Africa's quest for sustainable employment solutions finds an ally in these twin engines of progress.

Encouraging entrepreneurship and supporting small and medium-sized enterprises (SMEs) is not merely a strategic choice—it is a transformative opportunity to catalyse job creation, economic diversification, and the birth of innovation that can reshape the nation's economic landscape.

Entrepreneurship, with its spirit of ingenuity and risk-taking, is a potent force that can shift the needle on unemployment. By fostering an environment that nurtures and supports start-ups and SMEs, South Africa can unlock a wave of job opportunities. SMEs, often agile and responsive, have the potential to become significant contributors to the employment ecosystem, absorbing a substantial portion of the labour force and igniting a ripple effect throughout the economy. As these enterprises grow, they generate demand for a diverse range of skills, from marketing and sales to operations and management[2].

In the age of the 4IR, the link between entrepreneurship, innovation, and employment becomes even more pronounced. Emerging technologies and novel business models are the breeding ground for innovation, birthing solutions that

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[1] ILO. Guide to Recommendation 189: Job creation in small and medium sized enterprises Recommendation, 2O22 // [Electronic resource]: https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/-ifp_seed/documents/publication/wcms_847682.pdf.

[2] *Marobe D.* SMEs encouraged to tap into trends that drive job creation and growth // www.bizcommunity.com: [Electronic resource]. — URL: https://www.bizcommunity.com/Article/196/841/232426.html (date of address: 28.02.2024).

address pressing challenges and create avenues for economic growth[1]. Entrepreneurs, driven by the need to differentiate themselves in a competitive landscape, often embrace the latest technological trends, giving rise to disruptive products, services, and processes that challenge the status quo.

South Africa's embrace of entrepreneurship carries profound implications for the broader economic fabric. SMEs, often deeply rooted in local communities, have the potential to create jobs that are not only sustainable but also attuned to the specific needs of these communities[2]. Moreover, the innovation nurtured within these enterprises can spur economic diversification, reducing dependence on traditional industries and creating resilience against economic shocks.

However, the path to fostering entrepreneurship and innovation is not without its challenges. Access to capital, regulatory hurdles and the availability of resources can be barriers that aspiring entrepreneurs must overcome[3]. Encouraging entrepreneurship requires an ecosystem that provides mentorship, networking opportunities, and access to funding. It calls for partnerships between public and private sectors, academia, and civil society, all working in concert to provide an enabling environment for start-ups to flourish.

Inclusivity is a guiding principle in this endeavour. By ensuring that entrepreneurship opportunities extend to individuals from all segments of society, South Africa can tap into a diverse pool of talents and perspectives. Empowering women, young entrepreneurs, and historically marginalised communities to participate in this transformational journey can lead to a more inclusive and equitable economic landscape.

The marriage of entrepreneurship and innovation holds the potential to rewrite South Africa's narrative—an opportunity to forge a future where job creation, economic growth, and technological advancement coalesce[4]. By creating an ecosystem that nurtures entrepreneurs, supports SMEs, and celebrates innovation, the nation can set itself on a trajectory that not only addresses unemployment but also drives

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[1] *Naude W.* Entrepreneurship, Education, and the Fourth Industrial Revolution in Africa. IZA DP No. 10855, 2017. 25 p.

[2] *Burch S., DiBella J., Wiek A. [et al.].* Building urban resilience through sustainability-oriented small- and medium-sized enterprises, Urban Transform, 2022, no. 4 // [Electronic resource]: https://urbantransformations.biomedcentral.com/articles/10.1186/s42854-022-00041-9.

[3] *Van Vuuren J. J.* Five of the most common challenges faced by South African entrepreneurs // www.gviafrica.co.za: [Electronic resource]. — URL: https://www.gviafrica.co.za/blog/5-of-the-most-common-challenges-faced-by-south-african-entrepreneurs/ (date of address: 28.02.2024).

[4] World Bank. South Africa Economic Update: South Africa's Labor Market Can Benefit from Young Entrepreneurs, Self-Employment // www.worldbank.org: [Electronic resource]. — URL: https://www.worldbank.org/en/country/southafrica/publication/south-africa-economic-update-south-africa-s-labor-market-can-benefit-from-young-entrepreneurs-self-employment (date of address: 28.02.2024).

economic prosperity. As the 4IR unfolds, these pillars become the bedrock upon which South Africa can build a more resilient, diverse, and thriving economy.

Ensuring that all segments of society have access to digital technologies and the internet can help bridge the digital divide[1], enabling more individuals to participate in the evolving economy. In the age of the Fourth Industrial Revolution (4IR), where the digital landscape expands with each keystroke, the pursuit of economic advancement and social progress hinges on a fundamental premise — digital inclusion. As South Africa grapples with the complexities of unemployment against the backdrop of transformative technological changes, the opportunity to ensure equitable access to digital technologies and the internet emerges as a potent force for change. Digital inclusion is not just about connectivity—it is a key that can unlock doors to education, opportunity, and empowerment, thereby enabling all segments of society to participate in the evolving economy.

The digital divide, a multifaceted gap that separates those with access to digital resources from those without, is a phenomenon that has far-reaching implications. In South Africa, a country marked by both vast inequalities and aspirations for economic growth, the digital divide can perpetuate and exacerbate the chasm between the privileged and the marginalised. Access to the internet is no longer a luxury. In 2021, the number of mobile internet users in South Africa amounted to almost 47.8 million[2]; it is a prerequisite for participation in an increasingly interconnected world. Without this access, individuals are deprived of a window into a realm where learning, job seeking, entrepreneurship, and civic engagement are increasingly mediated.

Digital inclusion, at its core, is about levelling the playing field. By ensuring that even the most remote corners of the nation have access to digital technologies, South Africa opens up a universe of opportunities[3]. Education, which is often hailed as the great equalizer, is undergoing a transformative shift in the digital age. Online courses, virtual classrooms, and open educational resources become accessible to individuals who might otherwise be limited by geographic constraints[4]. This

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[1] *Hanna K. T.* What Is The Digital Divide and How Is It Being Bridged? // www.techtarget.com: [Electronic resource]. — URL: https://www.techtarget.com/whatis/definition/digital-divide (date of address: 28.02.2024).

[2] Mobile internet user penetration in South Africa from 2018 to 2027 // www.statista.com: [Electronic resource]. — URL: https://www.statista.com/statistics/972866/south-africa-mobile-internet-penetration/ (date of address: 28.02.2024).

[3] *Adedokun T. and Zulu S. P.* Towards digital inclusion in South Africa: the role of public libraries and the way forward, Interdisciplinary Journal of Economics and Business law, 2022, 11(4). p. 127–154.

[4] *Mills J.* Why Online Learning Can Create Equitable Access to The Great Equalizer // www.educationandcareernews.com: [Electronic resource]. — URL: https://www.educationandcareernews.com/online-education/why-online-learning-can-create-equitable-access-to-the-great-equalizer/ (date of address: 28.02.2024).

democratisation of education creates a pathway for skill acquisition and personal development that can empower individuals to transcend the limitations of their circumstances.

In the realm of employment, digital inclusion becomes a gateway to participation in the 4IR-driven economy. Online job platforms, remote work opportunities, and digital skill training programs are often gateways to employment in an increasingly digitised world[1]. However, these avenues remain inaccessible to those without connectivity. As industries evolve and new job roles emerge, digital skills become essential not only for employability but also for upward mobility. By ensuring that every citizen has access to digital resources, South Africa can create a workforce that is better equipped to thrive in the ever-changing job landscape.

Yet, achieving digital inclusion is a multifaceted challenge. Infrastructure gaps, limited resources, and socioeconomic disparities can hinder progress. Ensuring connectivity to remote areas requires investments in network expansion and innovative approaches, such as community centers and public Wi-Fi initiatives. Moreover, digital literacy programs are essential to bridge the knowledge gap and empower individuals to make the most of digital resources.

Digital inclusion must be pursued with an unwavering commitment to inclusivity. Historically marginalised communities, women, and underserved populations must be at the forefront of these efforts. Tailored programs that address the unique challenges faced by these groups can ensure that the benefits of the digital age extend to all corners of society.

In the confluence of unemployment challenges and the dynamic waves of the 4IR, digital inclusion emerges as a powerful equalizer. By ensuring that digital resources and opportunities are accessible to all, South Africa can create a future where economic growth is not an exclusive privilege but a shared endeavour. In the face of a rapidly evolving technological landscape, digital inclusion becomes the cornerstone of a more equitable, empowered, and participatory society—one where every citizen has the tools to shape their destiny and contribute to collective progress.

As South Africa deals with big changes brought by the Fourth Industrial Revolution (4IR) and continues to face the problem of many people being without jobs, leaders have a chance to make important changes by creating smart policies. The coming together of these two things gives policymakers a unique opportunity to plan a path that helps people use new technology, develop skills for work, and make more jobs. This mix could possibly reduce the bad effects of the 4IR on unemployment and set the stage for a stronger and more inclusive future.

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[1] *Charles L. Xia S. and Coutts A. P.* Digitalization and Employment // [Electronic resource]: https://www.ilo.org/wcmsp5/groups/public/ed_emp/documents/publication/wcms_854353.pdf.

Technological adoption, one of the cornerstones of a successful 4IR transition, is often propelled by conducive policies. Incentives for businesses to invest in automation, research and development, and digital infrastructure can fuel innovation and catalyse economic growth[1]. Tax incentives, grants, and other forms of support can stimulate the development of start-ups and SMEs, which are often engines of job creation and innovation. Furthermore, policies that encourage collaboration between academia, industry, and research institutions can expedite the translation of cutting-edge technologies into practical solutions that address societal challenges.

Crucially, workforce development must stand at the forefront of policy initiatives. The 4IR demands a workforce adept in digital skills, critical thinking, adaptability, and creativity. Government policies can drive the creation of training programs, vocational courses, and reskilling initiatives that equip individuals with the skills needed to thrive in an evolving job market[2]. Collaboration with educational institutions and the private sector can ensure that these programs remain relevant and aligned with industry needs.

Job creation, the ultimate goal, can be fuelled by policies that nurture industries with potential for growth in the 4IR era. Industries such as renewable energy, data analytics, e-commerce, and advanced manufacturing hold promise for job creation, but their realisation hinges on a supportive policy framework. Investment in infrastructure, regulatory reforms that foster innovation, and measures to attract foreign direct investment can create an ecosystem where these industries can flourish, generating employment opportunities for a diverse range of skill sets[3].

However, the journey of crafting effective policies is fraught with complexities. Striking a balance between incentivising innovation and ensuring equitable outcomes requires careful consideration. Policymakers must grapple with the ethical implications of technological advancements, including issues related to data privacy, cybersecurity, and social inequality. Moreover, ensuring that policies are inclusive, considering the needs of historically marginalised communities, is essential to prevent the perpetuation of existing disparities.

The significance of government policies in shaping the trajectory of South Africa's 4IR journey cannot be overstated. These policies are the compass that guides the

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[1] *Gherghina S. C., Botezatu M. A., Hosszu A. and Simionescu L. N.* Small and Medium-Sized Enterprises (SMEs): The Engine of Economic Growth through Investments and Innovation, 2020)12(1) Sustainability, 2020, 12(1). P. 347.

[2] *Harve A.* Reskilling the Workforce for the Fourth Industrial Revolution // [Electronic resource]: https://trainingin"dustry.com/articles/workforce-development/reskilling-the-workforce-for-the-fourth-industrial-revolution/.

[3] *Müller G. and Camera F. L.* The Renewable Energy Transition in Africa // www.irena.org: [Electronic resource]. — URL: https://www.irena.org//media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf (date of address: 28.02.2024).

nation through uncharted waters, enabling it to harness the transformative potential of technology while safeguarding against unintended consequences. By fostering an ecosystem that supports technological innovation, nurtures a skilled workforce, and stimulates job creation, South Africa can not only navigate the challenges of the 4IR but also transform them into opportunities for sustainable employment and economic prosperity. In the realm where policy and progress intersect, the blueprint for a brighter future awaits its architects.

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The significance of government policies in shaping the trajectory of South Africa's 4IR journey cannot be overstated. These policies are the compass that guides the nation through uncharted waters, enabling it to harness the transformative potential of technology while safeguarding against unintended consequences[2]. By fostering an ecosystem that supports technological innovation, nurtures a skilled workforce, and stimulates job creation, South Africa can not only navigate the challenges of the 4IR but also transform them into opportunities for sustainable employment and economic prosperity. In the realm where policy and progress intersect, the blueprint for a brighter future awaits its architects.

4. CONCLUSION

The Fourth Industrial Revolution presents South Africa with a complex set of challenges related to unemployment. However, it also offers opportunities for innovation, economic growth, and job creation. By taking proactive measures to address the challenges and capitalise on the opportunities, South Africa can navigate the 4IR to create a more inclusive and resilient workforce, ultimately contributing to the country's sustainable development and economic prosperity. As South Africa stands at the crossroads of the Fourth Industrial Revolution (4IR) and the daunting challenge of unemployment, the confluence of these dynamics unveils a narrative that is both complex and transformative.

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[1] *Kumar V.* Navigating the Ethical Implications of Technology, 2023 // [Electronic resource]: https://medium.com/the-modernscientist/navigating-the-ethical-implications-of-technology-6c579e120df.

[2] *Wentzel W.* Enabling policies awaited after 4th Industrial Revolution Report // www.webberwentzel.com: [Electronic resource]. — URL: https://www.webberwentzel.com/News/Pages/enabling-policies-awaited-after-4th-industrial-revolution-report.aspx (date of address: 28.02.2024).

The 4IR's impact on the nation's workforce is profound and multifaceted, carrying the potential to amplify job displacement and exacerbate existing inequalities. Yet, within this intricate tapestry of challenges lies an array of opportunities that can shape a more promising future—one characterised by innovation, economic resilience, and meaningful job creation. By orchestrating a symphony of proactive measures that address the challenges while harnessing the opportunities, South Africa can navigate the 4IR to craft a more inclusive and vibrant landscape of employment, advancing the cause of sustainable development and prosperity.

The challenges posed by the 4IR are undeniable. Automation and digitalisation, as harbingers of technological progress, can displace traditional jobs and widen the chasm between skilled and unskilled workers. The informal economy, so deeply woven into South Africa's fabric, stands vulnerable to disruption, potentially pushing more individuals into underemployment or unemployment. Amidst these challenges, the skills mismatch emerges as a critical concern, with the rapid pace of technological change outpacing the workforce's ability to adapt, thus threatening to leave many behind in an evolving job market.

However, within these challenges reside opportunities that, if seized strategically, can redefine the nation's trajectory. Reskilling and upskilling initiatives can serve as bridges that empower individuals to traverse the evolving job landscape, turning potential job losses into avenues for career transformation. Entrepreneurship and innovation, harnessed through supportive policies and ecosystems, hold the promise of not only job creation but also the diversification of industries and economic resilience. The clarion calls for digital inclusion, ensuring that all segments of society have access to digital technologies and the internet, presents an avenue to bridge the gap between the privileged and the marginalised, fostering a more balanced involvement in the digital economy.

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