





Investigating the conceivable recipients of the fourth industrial revolution: an experience of Balobedu's indigenous people

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ABSTRACT

The advent Fourth Industrial Revolution (4IR) is anticipated to revolutionise all sectors of human development, particularly the economy, education, agriculture and healthcare propelled by the Internet of Things (IoT), artificial intelligence (AI), virtual reality (VR), robotics and disruptive technology. South Africa like many other countries of the world is expected to adopt the 4IR to transform the lives of its citizens. In light of this, in this paper we argue that the adoption of the 4IR will also benefit the South African indigenous communities. Thus, we use the experiences of the Balobedu indigenous people of Ga-Ramotshinyadi village from Mopani District in the Limpopo Province of South Africa to establish the conceivable recipients of the 4IR. This study employed a qualitative research approach with a sample of 12 participants who were 6 youth, and 6 elderly knowledge holders sampled from Ga-Ramotshinyadi village using purposive and snowball sampling techniques. The qualitative data was collected using semi-structured interviews as the sole data collection method and analysed through thematic analysis. In determining the recipients of the 4IR the paper discovered that youth, educated community members, and entrepreneurs are highly to benefit from the adoption of the 4IR. This paper concluded that the 4IR can be integrated with South African education curriculum, particularly in primary schools which can assist in building technologically advanced communities. The paper further accentuated that the South African indigenous communities may use 4IR to integrate with their indigenous knowledge which may be achieved through collaborative initiatives with government agencies.

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Introduction

Technology has always been an indispensable part of people's lives for various purposes such as communication, transportation, architecture, healthcare, and farming. Gathogo (2023) alludes that before the introduction of Western or modern technologies in Africa, the African indigenous people previously relied on their indigenous technology which mainly consisted of early technological inventions such as bone, iron and stone tools. With the world being dynamic, most African indigenous communities have adopted Western technologies at the expense of indigenous technology (Manabete & Umar, 2014; Ndasuka, 2024). Gathogo (2023) argues that the adoption of Western technologies was influenced by colonisation when the Europeans came to Africa which was the period which saw the decline of indigenous technology.

To this day, the Western technologies are still part of African indigenous communities. According to Schwab (2017) the Western technologies have been growing rapidly all over the world including Africa and their growth is currently categorised as Industrial Revolution (IR).

The categorisation of technology as an IR began in Europe and later spread across the globe including the African continent in the 1760s to the 1840s (Chen, 2024). Since the first IR, the world is now experiencing the fourth era referred to as the 4IR and Industry

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4.0. This era of the 4IR is characterised by well-advanced technologies that are run by artificial intelligence, robotics, and virtual reality (Mlambo & Mhlanga, 2023). The 4IR has become the most anticipated era of technology which is expected to revolutionise societies more especially in the economic sector. In their study, Ajani *et al.* (2024) argued that the indigenous communities are not to be exempted, therefore are also expected to be impacted by the 4IR. In this paper, the authors unpack the prospects of adopting the 4IR in African indigenous communities from the experiences of Balobedu indigenous people in the Limpopo Province of South Africa. Thus, in this paper, we argue that with the advent 4IR not everyone in the indigenous communities will benefit from the 4IR. The research paper was guided by the research question, “Who are the conceivable recipients of the 4IR in Balobedu indigenous communities?”

The remaining part of the paper covers the theoretical and conceptual background and review of the literature. This is followed by research and methodology, a discussion of findings, and a conclusion.

Literature Review

Theoretical and Conceptual Background

The study was grounded by the Diffusion of Innovations (DoI) theory and the Technological Acceptance Model (TAM). The DoI was incepted by Everett Rogers which emphasises that people in a community or society adopts to new innovations at different time (Atkin *et al.*, 2018). In context of this study, the DoI implies that 4IR technologies are new innovations to the African indigenous communities, therefore, the indigenous people may adopt them at different times. The TAM was incepted by Fred Davis which emphasises that people adopt new technologies to their lives because they can relate and use the technologies (Ozili, 2014). In context of this study, the TAM provides an understanding that the indigenous communities may adopt the 4IR technologies if only they can relate to them and perceive them as useful.

Development of Industrial Revolutions

The 4IR is the current stage of technology that the world is currently facing (Oke & Fernandes, 2020). This points out that the IRs did not commence from the fourth stage, it has historical developments and has gradually evolved from the first IR to the current stage which is the 4IR (Mahomed, 2018:93). This indicates that there was a first, second and third IR before the 4IR. Each stage of the IRs has its type of technology and its impact on countries and/or indigenous communities. Though the stages of IRs vary, some of the technologies are being modified from the previous IRs' technologies (Xu *et al.*, 2018). This designates that the IR stages are succeeding one another and adding new technological developments from the previous IR technologies. For example, the 4IR is an advancement of the third IR. Despite it being a continuation of the third IR, the 4IR has its type of technologies that define it and that differentiate it from the first, second, and third IRs.

The first IR came to rise in the 18th century and lasted until the 19th century (Oke & Fernandes, 2020). Schwab (2017) professed that the first IR was a period that commenced around the 1760s to the 1840s and involved the invention of technological tools designed for mass production in industrial environments. According to Chen (2024), the first IR was incepted in Great Britain and quickly spread all over Europe, America, Asia, and Australia including Africa. This indicates that the IR technologies were adopted all over the world despite the existence of indigenous technologies. Furthermore, the first IR was chiefly influenced by the corporate world to minimise business costs and workload (Xu *et al.* 2018:90). Angela and Chinyere (2019:24) highlighted that in reducing human effort the first IR focused on the utilisation of water to produce steam engines that aided in the manufacturing processes and mass production of goods. Xu *et al.* (2018:90) add that water and coal were the vital elements that had a major part in producing the first IR technologies. Xu *et al.* (2010:91) further highlighted that coal and steam engines were used in trains which was the only innovative technological transport available during the first IR. Although the first IR affected all continents, in contrast, Angela and Chinyere (2019:92) contended that most African countries and their indigenous communities overlooked the use of first IR technologies and did not adopt them immediately after their introduction. This means that during this period most of the African indigenous communities hinged on their indigenous technology and were not affected by the first IR technologies and their indigenous technology was still relevant to them. However, as Chen (2024) indicated that the whole world adopted the first IR, it can be concluded from Angela and Chinyere's (2019:92) view that African indigenous communities adopted the first IR technologies after a lengthy period.

The world's societies and technologies are not stagnant meaning that they are perpetually evolving (de Vries *et al.*, 2016). The advancements and/or innovation of technologies evolved from the first to the second IR. According to Schwab (2017:07), the second IR came to rise in the middle of the end of the 19th century and the beginning of the 20th century. Furthermore, Oke and Fernandes (2020) professed that the second IR commenced around the year 1870. To cite Chen (2024) the technological advancements and innovations of the second IR involved the inventions of steamships, railroads, textiles, and agricultural farming technologies such as tractors. In addition, Schwab (2017:07) also pointed out this was the period that saw the emergence of electricity.

The inventions of agricultural farming technologies show that the second IR may have minimised the use of indigenous hand hoes for farming. Granting that the second IR involved the inventions of agricultural technologies, Blench and Dendo (2006:3), maintained that African indigenous communities had hand hoes as their main indigenous farming technology which they stuck to even during the second IR. Moreover, the use of hand hoes and other iron-made technological tools dates back 12,000 years ago (Blench &

Dendo, 2006:3). This indicates hand hoes have always played a major role for African indigenous communities as a farming technology. Though the second IR also involved the occurrence of technologies, Schwab (2016:12) indicated that only a few of the indigenous communities did not have access to electricity. This view contrasts with Angela and Chinyere (2019:28) who outlined that most of the African indigenous communities of Nigeria did not adopt the second IR. This could indicate that the second IR was not quickly adopted by African indigenous communities, as a result, others are in the process of fully adopting it.

As technologies continued to change, the innovations after the second IR led to the commencement of the third IR. According to Oke and Fernandes (2020), the third IR started in 1969 and rotated around electronics and the internet. Schwab (2017:7) highlighted that this period was mainly referred to as the digital and/or computer revolution. This indicates that the third IR mainly focused on the inventions of computers and information technology (IT). IT and electronics were and are still utilised by most industries to produce commercial products (Xu *et al.*, 2018). The robots and the automaton programmable logic controllers (PLCs) were the two central inventions that shaped the third IR (Mlambo & Mhlanga, 2023). The PLCs and robots involved the production of phones, computers, cars, and aircraft (Xu *et al.* 2018). This IR is still common in current societies including most African indigenous communities. The use of phones, computers, and cars is widely accepted in most African indigenous communities. However, it is not all the indigenous people within a community who have access to them because of socio-economic imbalances and/or development (Fu *et al.*, 2010). This highlights that the economic state is a factor that lowers the adoption and adaptation of new inventions. Moreover, computers, printers, and information technology are mainly used in corporate environments including people's personal use. (Xu *et al.*, 2018)

The development of the IRs is in the fourth stage. There is less information about the precise time frames for the commencement of the 4IR. However, according to Angela and Chinyere (2019:26), the 4IR is imminent and can occur at any time. In contrast, Xu *et al.* (2018:91) professed that the 4IR has already started, and it came into existence in the year 2000 and is progressing from the third IR. This highlights that the third and 4IR are similar in most of the characteristics. However, the 4IR is characterised by huge developments in digitalisation, Information Technology and it is trying to merge humankind with technology (Oke & Fernandes, 2020). Nevertheless, the 4IR stage revolves mainly around artificial intelligence, robotics, and the internet of things (Mahomed, 2018). To cite Russell and Norvig (2016) artificial intelligence refers to the ability of phones or computers to function or think like human beings. Robotics encompasses the science of manufacturing automated machines that are invented to mimic human behaviours. Lastly, the internet of things involves the technologies which are connected and controlled by the internet (Angela & Chinyere, 2019:27).

Challenges of the Fourth Industrial Revolution:

According to the South African Innovation Summit (2018), the world is continuously evolving and gyrating around technological advancements. This points out that the evolution of technology always brings new concepts and innovations that reduce human efforts within the social, political, and economic settings. Nonetheless, Idowu (2024) argued that despite the arising of new advanced technologies, the evolution of technology also raises challenges in social, economic, and political settings.

Acceleration of Unemployment

Employment is one of the major concerns when it comes to the adoption of the 4IR (Schwab, 2016:37). The new technological advancements of the 4IR will create new jobs; however, it will also reduce the employment rate (Angela and Chinyere (2019:29) and Xu *et al.* (2018:92). The industrial revolutions will always be needed to reduce human efforts. Nonetheless, not everybody is benefiting from the inventions of new technologies. Looking at the negative impact of the 4IR in employment, Wlawdowsky-Berger (2017) indicated that it remains unidentified on which jobs will be cut down by the 4IR. However, the South African Innovation Summit (SAIS) (2018:4) predicted that the professions of couriers, telemarketers, psychologists, secretaries, human resource managers, umpires, and insurance appraisers are likely to be supplanted by the 4IR. This denotes that the mentioned jobs are those that can be completed by artificial intelligence, robotics, and the internet of things.

According to Consumer News and Business Channel (CNBC) Africa (2019) and eNews Channel Africa (eNCA) (2019) the Standard Bank of South Africa has shut down 91 branches in all nine provinces. eNCA substantiated that out of 91 branches 47 of them were shut down in Gauteng. This highlights that many people who lost their jobs were in the Gauteng province. Furthermore, CNBC Africa (2019) and eNCA (2019) all affirmed that about 1200 Standard Bank employees were affected by the closing of the branches. The internet of things, robotics and artificial intelligence are the main reasons behind the closing of the branches. The logical explanation for the closing of branches is that currently people hardly go to the banks for consultations. The developed banking applications, internet banking, and automated teller machines (ATMs) enable bank customers to transfer, deposit, and change personal identification numbers (PINs) without going to bank branches.

Expensiveness

Although the 4IR technologies were mostly invented to operate in the corporate environment, there are some which are designed for people to use in their social environment. These may involve new inventions such as advanced televisions, smartphones, or cars. Although they are designed for people the major challenge hindering its adoption by most people is that they are expensive (Kahreka, 2013). This expensiveness of the 4IR technologies may be one of the challenges that lags their adoption in most of African indigenous communities (Kahreka, 2013). According to Angela and Chinyere (2019:28), most of the African indigenous communities of Nigeria including South Africa did not adapt to the first and second IR. The expensiveness was one of the challenges that made African

indigenous communities not afford and or adopt the inventions of the first and second industrial revolutions at an early stage (Angela & Chinyere, 2019:28).

Risk in Cyber-Security

Most of the 4IR technologies are being run by information technology (IT), which makes most users vulnerable to cyber threats (Dimitrieska *et al.*, 2018:185). The self-driven cars that drive themselves with the assistance of IT are also a challenge to societies as the self-driven cars are subject to being hacked or malfunctioning electronically. This points out that self-driven cars can be hacked to cause car accidents. Not only self-driven cars, the government, companies, and any individual's sensitive or useful data stored in computer databases or phones can also be cyber-attacked. This is a challenge that is inescapable when it comes to the technologies run by IT (Fu *et al.*, 2018:93). This challenge implies that adopting 4IR technologies that are run by the IT the data or cyber security must be seriously considered and be improved.

Negative Cultural Evolution

According to de Vries *et al.* (2016:23), the influence of the exogenous knowledge systems always affects the African IKS negatively. This points out that adopting the 4IR may lead to cultural change. Osuala (2012:17) adds that the adoption of modern technologies reduces the use of local African indigenous technologies. This points out the Fourth Industrial Revolution may be a challenge to African indigenous technologies as they are likely to be replaced by the new technologies of the 4IR. Moreover, the full adoption and adaptation of the 4IR may completely change the indigenous ways of living into modern technological ways of living.

Dwindling of Human Interaction

The adoption of the internet of things and artificial intelligence technologies is a major threat to the indigenous communities' togetherness and cohesion. The sophisticated advancements in communication technologies allow people to discuss anything over the phone through social media and voice calls without meeting (Osaat & Oyet, 2012). Moreover, the use of online or internet shopping allows people to order anything online for example food, furniture, clothes, and they get delivered to their preferred address without leaving the comfort of their houses. The ordering of goods online also means that communication with neighbours, friends, and/or community members will be reduced.

Global Trends on 4IR and Indigenous Communities

The indigenous communities are experiencing life under the 4IR. Thus, this part of review, outlines the global experiences of the 4IR using Singapore and South Africa as an example.

Singapore

Singapore like many other Asian countries is experiencing life under the era of the 4IR. Gleason (2018) stated that the Singaporean government has been involved in promoting the 4IR to its citizens. The promotion and adoption of 4IR in Singapore is invested in their education (Vora-Sittha & Chinprateep, 2021). Thus, through the Ministry of Education, Singapore has established such as Skillsfuture and Smart Nation Singapore as initiatives that are tailored to prepare Singapore citizens with the 4IR skills. In 2017 44 percent of jobs in Singapore were reported to be driven by the 4IR technologies, particularly the automobile (Gleason, 2018).

South Africa

South Africa through the Presidential Commission on the Fourth Industrial Revolution (PC4IR) and the National Development Plan (NDP) has committed to establishing technologically wise communities driven by technology in economy and human development. Despite the commitments of the country to adopt the 4IR, is still faced by the challenges of fully adopting the 4IR. Sutherland (2019) also augments that the challenges affecting South Africa towards the adoption of 4IR is the poor state governance which is affecting policy formulation and implementation of the existing policies. Poor 4IR policy implementation makes it difficult for the South indigenous communities to cope with the technological advancement because of the lower economy (Selelo, 2023). Other scholars such as Enaifoghe *et al.* (2021) have recommended South Africa implement the integration of 4IR technologies in education particularly the primary schools in indigenous or rural communities as a foundation for building a 4IR South Africa.

Research and Methodology

The study employed an exploratory qualitative research design to approach the study from the experiences of the indigenous communities. In sampling, 12 participants were sampled through purposive and snowball sampling. These participants were sampled based on their expertise and experiences with the 4IR and the IK. Thus, the sample consisted of 6 youth and 6 elderly knowledge holders who reside in Ga-Ramošhinyadi village which is one of the Balobedu indigenous communities in the Mopani District of the Limpopo Province, South Africa. The age range of the sampled youth participants was 18-32 and 40-70 for the elderly knowledge holders. The semi-structured interviews were used as the sole data collection method. The purpose of using semi-structured interviews was to acquire extensive knowledge from the participants and to use probes and/or follow-up questions. For the analysis purposes, the authors employed the thematic analysis. Therefore, the data was analysed using the emerged themes and sub-themes which provided clear interpretations of the indigenous people's experiences on the 4IR and IK. Throughout the data collection to analysis,

the authors ensured informed consent, voluntary participation, confidentiality and anonymity. The limitation encountered is the sample size which may affect or impact the generalisability of the results.

Findings and Discussions

The qualitative data is presented thematically below.

Recipients of the 4IR in Balobedu' Indigenous Communities

The 4IR continues to spread all over the world transforming how societies live and communicate (Mlambo & Mhlanga, 2023). The African indigenous communities cannot be exempted and, therefore, are part of the communities that may benefit from the 4IR communities. The DoI theory as the theoretical foundation of the study provides an understanding that not everyone in a community or society may benefit from the innovations introduced to them. Similarly to the study findings, not everyone in Ga-Ramotshinyadi and other Balobedu indigenous communities will benefit from the advent of 4IR technologies. Thus, the conceivable recipients of the 4IR technologies are outlined below as the emerged sub-themes.

Youth

The participants unveiled that that the contemporary youth are born in an era that is fuelled with advanced technologies which makes them the key beneficiaries of adopting the 4IR technologies as compared to the other members of the community. The study found that the youth are living in a different generation compared to the elders of the community, therefore, with the new 4IR developments, youth are more likely to adopt these technologies considering that they can easily relate to them than their elders. Similarly to this finding, Guner and Acarturk (2020) concurred that the main divider between the contemporary youth and their elders is the ability to use and operate the 4IR technologies which are influenced by age differences. It can be deduced that the elderly community members have little interest in technological developments because of their age, while on the other hand, the curiosity of the youth allows them to be up to date with technological developments. One elderly knowledge holder and one youth said:

"Bjalo ka ge o bona, ke tšofetše. Ga ke na tsebo e ntši mabapi le go šomiša thekinolotši go swana le bana baka. Theknolotši yeo ke e tsebago le dithaka tša ka ke mogala, sellalemoya le TV. Theknolotši tša go ba bothata ke tša bana ka gobane ke bona bao ba belegetšwego lefaseng la tšona." (Elderly knowledge holder, Male)

"As you can see, I am old. I do not have as much knowledge about using technology as my children. The technology that I know with my peers is the phone, radio and TV. Other complicated technology is for my children because they are the ones born into the world of technology." (Translated) (Elderly knowledge holder, Male)

"ke nagana gore basa ke bona ba tlo ke ketlago kudu, ka gore ba ithutela ka di theknolotši tše tše di botse kua dikolong." (Youth, Female)

"I think youth will benefit most, as they learn about these good technologies at schools." (Translated) (Youth, Female)

From the two responses, it can be inferred that the adoption of the 4IR technologies by youth can be attributed to their impacts on their lives. Thus, the participants opined that the new era of jobs requires people's ability to have recent technological skills. The participants further indicated that 4IR technologies are not foreign to the African indigenous communities, however, it is only the youth who are benefiting from these technologies as they contribute to their academic and career.

Entrepreneurs

The emergence of the 4IR is aimed at improving the lives of people particularly boosting the economy of businesses (Schwab, 2017). The participants concurred with this as they believed that the 4IR technologies have the potential to improve the lives of entrepreneurs in the community. The participants indicated that the 4IR technologies have the potential to minimise costs in the working areas. In minimising business costs, the study found out that robotics and artificial intelligence can be programmed to function like human beings which can perform works those human beings do in their working areas. The participants indicated that most of the entrepreneurs in Balobedu's indigenous communities are still reliant on traditional methods for their businesses. The participants highlighted that it is only a few entrepreneurs use the 4IR technologies for their businesses, however, when fully adopted, the 4IR technologies may benefit them. One of the youth participants reflected the following regarding the entrepreneurs as prospect recipients of the 4IR:

"Dithekinolotši di hlangwa bakeng sa go dira tšhelete ya dikgwebo. Ke nagana gore 4IR e tla hola borakgwebo setšhabeng sa rena ka gobane theknolotši ye e nolofatša kgwebo" (Youth, Male)

"Technologies are invented to make money for businesses. I think 4IR will benefit businesspeople in our community because these technologies simplify business." (Youth, Male). (Translated)

The study unveiled that many entrepreneurs may benefit from the 4IR technologies. According to the participants, most entrepreneurs may benefit from these technologies only if they are provided with enough training and awareness.

Educated Community Members

Contemporary education is influenced by modern technologies that boost people's technical skills (Khreisat *et al.*, 2024). The study discovered that illiteracy contributes to people's ability to adopt the 4IR technologies or not. The youth participants indicated that community members who are educated are more likely to adopt and use the 4IR technologies than those who are not educated. Sundani (2023) argues that the 4IR consists of well-advanced technologies that are mostly programmed to use the English language. Similarly to the study findings, it was revealed by the participants that the community members who are not educated may struggle with benefiting and using the 4IR technologies.

“Ke nagana gore theknolotši e nyaka motho yo a kgonago go bala le go ngwala. Go ya ka nna, bao ba sa kgonago go bala le go ngwala ba ka ba le mathata a mantši a go amogela theknolotši ye.” (Youth, Male)

“I think technology needs someone who can read and write. According to me, those who cannot read and write may have difficulties a lot to adopt these technologies.” (Youth, Male)

The participants indicated that most of Balobedu indigenous communities including Ga-Ramotšhinyadi have most of the elderly people who are not advanced with technological skills and, therefore, have fewer chances of adopting the 4IR technologies. The elderly knowledge holders in the study showed interest in knowing and adopting these technologies, however, their main challenge is not having the technological skills and the relevance of these technologies to their lives. The participants indicated that while educated community members are key recipients of the 4IR technologies, awareness and training on the importance of the 4IR technologies may uplift the uneducated community to be readily available to adopt these technologies. The participants further emphasised some of the community members can be included in the development of technologies that may have an impact on their lives. This implies that some of the 4IR technologies can be trained to the community members without needing an educational background.

Balobedu's Experiences on Adopting the 4IR Technologies

The participants unveiled that Balobedu indigenous people have concerns towards the adoption of the 4IR technologies. According to the participants, the 4IR does have positive impacts on their lives, however, these technologies come with detrimental challenges. According to participants, the main challenges of adopting the 4IR include expensiveness, lack of technical education, and relevancy to the community. This implies that for the effective adoption of the 4IR, such concerns will need to be addressed. In their study, Schelenz and Schopp (2018) have highlighted that Africa remains one of the developing continents, thus, to be technologically wise, Africa still needs to address the issue of the digital divide which is influenced by the African government's little investment in technology despite frameworks like the Agenda 2063. In support of this, Okocha and Edafewotu (2022) commented that Africa is still pressed with issues of hunger and health which remain top priorities of the continent. There, for Africa to start prioritising 4IR technologies these issues may need to be minimised first. Balobedu indigenous like many other indigenous communities is also confronted with issues of adopting the 4IR technologies with some not seeing its relevancy in their lives. One of the youth participants said:

“Dithekinolotši tša 4IR di bitša kudu gomme di ka fihlelelwa fela ke batho ba mmalwa motseng. Nka re batho ba bangwe ba nyaka dithekinolotši tša 4IR eupša ga ba di šomiše ka gobane ga ba tsebe go di šomiša ebile ba bona kamano ya tšona le maphelo a bona. Ka tselo yeo ke e bonago ka yona, ba bangwe ba 4IR ba nyaka motho yo a nago le thuto.” (Youth, Female)

“The 4IR technologies are so expensive and can only be achieved by a few people in the village. I can say other people want 4IR technologies but do not use them because they do not know how to use them and see their relevance to their lives. The way I see it, some of the 4IR needs someone with education.” (Translated) (Youth, Female)

The elderly knowledge holders highlighted that if the community succeeds in fully adopting the 4IR technologies, there is a possibility of the disappearance of the IK. With the already existing 4IR technologies, the elderly knowledge holders have stressed that they have already substituted some of the IK practices. The participants revealed that the contemporary Balobedu generation, particularly youth are slowly moving away from their indigenous because of the foreign technologies. The elderly knowledge holders outlined smartphones and computers as one of the technologies that are driving the youth away from their IK. They believed that it is through these technologies that the youth learn and absorb their foreign culture at the expense of their own IK. Thus, the youth participants urged that the 4IR technologies can be mostly operated by youth, which leaves a space for the youth to take initiatives to merge the IK with these technologies.

Balobedu's Indigenous Knowledge and 4IR Technologies

The study unveiled that some of Balobedu's IK practices are on the brink of extinction as a result of the 4IR technologies. According to the participants, the adoption of 4IR technologies is inevitable as indigenous communities continuously develop and these technologies happen to solve some of the problems. The participants were of the view that since the IK practices are disappearing at the expense of the 4IR technologies, integration of the IK in these technologies may provide a better solution for reawakening the IK. Some of the IK practices that were deemed worthy to be integrated into the 4IR technologies included indigenous music, dances, games, songs, and storytelling. One of the elderly knowledge holders reflected the following:

“Bana baka ba fetša nako ye ntši ba le theknolotšing ya bona gomme ga ba na sebaka sa go ithuta tsebo ya setlogo yeo re ithutilego yona nakong ye e fetilego. Ka mengwaga ye ba nago le yona gona bjatše, rena re be re tšea karolo mekgweng ya setlogo tšia go swana le dipapadi, metantsho, mmimo gomme bjalo ka dithaka re be re tla ba le nako ya go anega dikanegeto go rena. Ke nagana gore tsebo ya rena ya setlogo e senywa ke theknolotši ya 4IR, mohlomongwe re ka swanelwa ke go kaonafatša tsebo ya rena ya setlogo ka go e lokela ka gare ga dikhomphutha le diphone, mohlomongwe seo se ka tsošološa tsebo ya rena ya setlogo.” (Elderly knowledge holder, Female)

“My children spend most of their time on their technology and they do not have the chance to learn the indigenous knowledge that we learnt in the past. At their age, we would participate in the indigenous practices like games, dances, music and as peers we would have storytelling time to ourselves. I think our indigenous knowledge is being damaged by the 4IR technologies and maybe we might need to improve our indigenous knowledge by putting it on the computers and phones, maybe that can revive our indigenous knowledge.” (Translated) (Elderly knowledge holder, Female)

The proposed strategies for preserving the IK included digitisation of the IK practices which can be turned into digital formats such as videos, digital books, and mobile applications. In support of this, indigenous scholars such as Mdhuli *et al.* (2021) and Balogun and Kalusopa (2022) have proposed community digital libraries as another way of preserving and managing for generations to come. Although moving the IK into 4IR technologies appears to be beneficial, Mdhuli *et al.* (2021) cautioned that there is a need to adhere to ethics to avoid the preservation of improper IK. In the words of Mdhuli *et al.* (2021),

“[...] digitalising of IK will not be for movies but for preservation, managing and sharing of IK, significant attention has to be devoted to examining the ethical problems associated with the digitalisation process. This is because some digital advertisement in South Africa has been characterised by the moral wrong of exaggerated competence.” (p.6)

The participants were also of the view that some of the IK content such as sacred sites may not be digitised because their misinterpretation may become an insult to the indigenous communities. This submission from the participants denotes a careful consideration in digitising the IK and also moving away from the IK that is unfit to be digitised.

Conclusion

The 4IR technologies are expected to radically change the lives of everyone in this modern era including the indigenous people. However, the study has established that not everyone is expected to benefit from the 4IR technologies. Thus, the study unveiled the youth, entrepreneurs, and educated people as the conceivable recipients of the 4IR technologies in Balobedu indigenous communities. With the 4IR being foreign to Balobedu indigenous people, this paper noted that the 4IR technologies may contribute to the loss of the IK practices. Thus, to limit this from happening, the study unveiled that the 4IR technologies may be merged with the IK as another way of preserving it and make it vibrant in this era of advanced technologies. However, this process will need to be approached with cultural sensitivity as not all of the IK may be suitable to be moved into the 4IR technologies.

Recommendations

Most of the 4IR technologies are not indigenous to the African indigenous people. Therefore, technical or digital skills are essential for the indigenous people to fully adopt the 4IR. Thus, this paper recommends that South Africa's Department of Basic Education (DoBE) integrate education with the 4IR technologies in indigenous communities as a foundation for future generations that are technologically equipped. Such integration may begin from the primary schools which may be an appropriate phase for children to learn these technologies at an early age.

Balobedu and other African indigenous communities should prioritise the preservation of their IK through the 4IR technologies since much of the IK is disappearing at the expense of 4IR. Thus, this paper recommends South African government initiate collaborative initiatives with the indigenous people that are tailored to offer training on IK digital preservation.

The 4IR is increasingly growing in African indigenous communities. Thus, the paper recommends further studies to be conducted to explore the long-term impact of the 4IR on the livelihoods of the African indigenous people.

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