Research Article

The Fourth Industrial Revolution: A Literature Study of Challenges Associated with Access to Education in Rural Schools in Zimbabwe

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Abstract

Research on access to education in Africa has resulted in the revealing of impediments working against the advancement of marginalised groups. Indeed, research shows that Africa lags behind the rest of the world in skills development. This paper reflects on the factors perpetuating hierarchies in the fourth industrial revolution, with particular attention on rural schools in Zimbabwe. It seeks to unearth challenges perpetuating inequalities in access to education. Utilising Fraser's model of social justice, this paper contributes to the unmasking of the potential disparities manifested by the fourth industrial revolution. Therefore, by exposing the challenges of the fourth industrial revolution, this paper highlights the complexity of achieving equal access to education. The findings point to the fourth industrial revolution as a global system that has been created over time and which is unfortunately not ready to meet the needs of rural schools in a developing country like Zimbabwe. The fourth industrial revolution escalates the subjugation of rural schools, complicating the exclusionary power structures. The fourth industrial revolution has brought about social colonisation, further widening deep-rooted status gaps. This paper explores some gaps in the literature that can be investigated further and may guide research to open avenues of social transformation.

Key words: social justice; rural schools; Zimbabwe; fourth industrial revolution; access

1. Introduction

The fourth industrial revolution is based on revolutionary technologies; for example, artificial intelligence, the internet, 3D printing and genetic engineering are not only making a significant impact on industrial production in terms of inputs and outputs (Prisecaru, 2017), but are also impacting social relations, as well as how knowledge is accessed and shared. The question is whether technological acceleration and expansion of production produce more wealth or worsen unemployment and social inequalities, considering that more people are poor when compared to those who are well off around the globe. Indeed, the combination of 3D printing and genetic engineering can lessen the cost of delivering products and services and can change the processes of production and results thereof. Magyar (2016) warns that robotics and other innovations endanger jobs, where on the other hand the Internet allows rapid communication and learning.

It is against this background that this paper reflects on the factors perpetuating hierarchies in

the fourth industrial revolution (4IR) in Zimbabwe. To be more specific, it seeks to unearth challenges worsening inequalities in access to education, with a focus on rural schools. In other words, the negative impact of the new technologies on access to education. It is worth noting that although the Internet has inaugurated several opportunities for knowledge development and practices, developed societies benefit from it the most (Coleman, 2016; Magyar, 2016). Mesnard (2016) observes that 4IR may narrow labour demand and impose new requirements for education. The rapid rate of exchange caused by digital technologies defining the 4IR, is not only limited to production of goods but includes labour forces related to knowledge and services which impose serious challenges for society (Coleman, 2016). Technology cannot be avoided; therefore, we are required to address or avoid the negative outcomes caused by technological changes (Prisecaru, 2017).

The 4IR requires teachers and learners to adapt to the era of information and acquire what Blinder (2008) calls specialised and qualitative skills according to the moment. However, this study delineates technological advancement as the source of social inequalities (Schwab, 2016), that is, technological divide. For the 4IR to be extended to rural schools, the technology must be embedded into the education system to scale up the effectiveness of education in disadvantaged contexts.

As a development concept, 4IR weighs heavily on national development and public investment policies that have been divided between urban and rural, with significant practical implications. According to the development discourse, rural schools are synonymous with poverty, poor access to education and poor infrastructure. Therefore, reducing the impact of poverty is a social justice concern that is connected to improving the lives of people living in rural areas. Education as a pillar of development in a country, is widely confirmed as having positive results on economic growth, earning and productivity (Ravider, 2008). The authors argue that on the development agenda, rural schooling is directly implicated. In Zimbabwe, rurality is a direct product of colonisation, resembling injustice and marginalisation. Thus, analysing 4IR and rural schooling cannot be complete without invoking social justice, in particular, Fraser's three dimensions of redistribution, recognition and representation. Social justice is founded on efforts to overturn structures and conditions that sustain marginalisation and segregatory practices and procedures in society.

2. Conceptual Framework

This study is rooted in social justice – advancing fairness in the provision of human and material resources and access to education, within the 21st century which is dominated by a techno-centric paradigm shift in education. Fraser's three dimensions of social justice are forwarded as more relevant than other social concepts for understanding issues of the 4IR that are, as the focus of this paper, denying access to education in rural schools in Zimbabwe. Identifying the issues may pave the way for the overcoming of economic, social, cultural and political disadvantages and marginalisation. Social justice reflects concepts of equality, equity and fairness, which are essential for democratic participation. Going further, Fraser (2007) explains the three dimensions as: redistribution, which entails equal distribution of material resources, recognition – rebuking status hierarchies and embracing differences, and lastly, representation – advocating inclusivity of all. Fraser's model of social justice encapsulates efforts pursuing justice in these perspectives that educational theory, policy and practice are grappling with.

The distribution perspective opposes any forms and degrees of economic dependence and inequalities that hinder equal participation (Fraser, 2007). Therefore, it seeks to deconstruct "social arrangements that institutionalise deprivation, exploitation and gross disparities in wealth and income, thereby denying some people the means and opportunities to interact with others as peers" (Fraser, 2007, p.27). The economic structure of society has created class differentials that are economically defined. At the core of the recognition dimension is the challenging of institutionalised patterns of cultural values, to ensure respect and equal opportunity for all people. This dimension excludes internalised value patterns that subjugate some categories of people and the qualities they have. In addition, it does not allow institutionalised value pattern systems that do not allow other

people the status of full partnership in society, by failing to acknowledge their circumstances. This dimension brings attention to the status order of society and culturally constructed hierarchies of status.

The representation dimension advocates for justice for the marginalised groups; in this case, rural schools in Zimbabwe. It focuses on inclusive schooling practices which are central to nurturing equitable patterns of recognition encompassing respect and esteem for segregated people (Keddie, 2012). Thus, the three dimensions are inseparable, and they encompass the class and status of marginalised communities; in this case, rural schools which are underrepresented, and whose plight is ignored. There has been a long-held concern for the underdevelopment in rural areas of Zimbabwe (Moyo, 2020) raising questions as to whether the rural schools are ready for the 4IR. The value of integration of ICTs in teaching and learning as a corollary to the 4IR is a benchmark from where to begin this analysis.

3. Methodology

This study was framed as a research informed analysis as it explored inequalities in access to education in the 4IR, with particular attention on rural schools in Zimbabwe. Literature related to the debates on the 4IR in Zimbabwe, national statistics in education, challenges of rural schools was reviewed. The pathways foregrounded in the Zimbabwean updated curriculum framework 2015-2022 for the integration of ICTs form a catalyst for this analysis. The reviewed curriculum framework provides a plan for transforming education with aim to prepare learners for the 21st century (Ministry of Primary and Secondary Education, 2015). Successful implementation of the 4IR relies on the integration of ICTs in education. Although particular focus was emphasised on Zimbabwe, reference was made to international literature to present ideal conditions that are enhancing access and success of the 4IR. Drawing from Fraser's model of social justice which framed this study, a traditional literature review was conducted in order to elucidate the nexus between ICT integration with 4IR. The interpretive phenomenological contextual analysis was used to make sense of the literature (Larkin, Watts and Clifton, 2006).

4. The State of Education in Zimbabwe

Education is a tool through which the world can be transformed. According to Zimbabwe National Statistics Agency (2016), with a total population of 13 447 286, 6 485 676 (48%) are males and 6 961 610 (52%) are females. Further analysing the statistics by location, 68% constitutes the rural population and 32% urban. Out of the total of the rural population, 51% are female and 49% male. Meanwhile, Zimbabwe has lost its glory as the bread basket of Africa and the most literate state on the continent, boasting 90% adult literacy and 98% youth literacy in 2002. Literacy and educational attainment have widely been acknowledged as crucial indicators of a country's development, because they nurture personal development and serve as determinants of acquiring employment and opportunities for individuals and overall human and social development (Doshi, 2014). In addition, the United Nations affirms education as an investment in human capital that guarantees both individual and societies to enjoy life to the fullest (UNESCO, 2014), closing the gap between social classes in terms of economic and social opportunities.

For the past two decades, Zimbabwe's economy has been struggling and education has been one of the services that has suffered, particularly in rural schools. After attaining political independence in 1980, Zimbabwe has still to provide its population with quality education. In this case, Masinire (2011) establishes that rural areas in Zimbabwe have remained underdeveloped, and the rural inhabitants are in vulnerable social and economic situations. Because of low socio-economic status, most rural residents are not included in local governance processes, which carry over to national development processes (FAO, 2017).

The Annual Education Statistics Profile (2017) shows that, of the new entrants into form 1 (first

year of secondary school) by location, 196 659 were in rural areas and 65 411 in urban areas. Early childhood development in rural areas shows 514 348, compared to 109 633 in urban areas; a total of 2 016 955 for rural primary school enrolment and 659 530 for urban primary school enrolment. The total enrolment for secondary schools in rural areas is 763 441, compared to the 311 884 enrolling in urban secondary schools. These figures speak volumes about the distribution of Zimbabwean learners by location. The majority of learners attend schools in rural areas where the teacher-learner ratio is very high. Rural secondary schools recorded a dropout rate of 46,33% in 2017, 29,9% in primary schools, owing to financial reasons. The primary school completion rate in rural areas for females stood at 77,74%, females 79,83%; lower secondary school: males 68,06% and females 66,65%; upper secondary school: males 16, 61% and females 13,2%. This shows how much education has become inaccessible. Of the total number of rural primary schools, 52,59% did not have electricity and 31,10% secondary schools had never had an electricity connection. Also in short supply were basic services like water, furniture, classrooms, qualified teachers, transport, computers and Internet connection. Schools are also geographically widespread and learners travel long distances to school.

In 1980, the government promised free primary education, affordable secondary education and equal access to education, without any form of discrimination and financial assistance for those who could not afford enough qualified teachers (Women of Zimbabwe Arise, 2009). Yet 41 years into independence, the promises of free primary education and subsidised secondary education have not been fulfilled. An effective education system requires safe buildings, enough furniture, stationery and textbooks and a viable economy, as well as government will, to fund the system. The largest portion of these problems are experienced in the rural areas. Characteristic of rural schooling is a lack of basic infrastructure, absence of involvement of the private sector and lack of government support. The majority of the school going population is in the rural areas which are plagued with scarcity of resources. This is a clear indication that the rural areas of Zimbabwe are deprived of quality education. A technological divide between rural and urban schools is widening, making the 4IR a dream to the largest portion of Zimbabwe who have not experienced the second and third industrial revolutions.

5. Infrastructural Challenges

Access to information, communication and technology (ICT) devices, as well as connectivity, are major challenges denying digital inclusion in Zimbabwean rural areas. Information, communication and technologies can be defined as technological gadgets and resources used to communicate, manage and create, disseminate and store information (Madangopal & Madangopal, 2018). The school enrolment in rural areas is more than in urban areas, which may explain the high demand for education beyond what the minimal resources can provide. The 4IR is functional in a supportive infrastructure, including content, data and applications.

Since the majority of the Zimbabwean population resides in the rural areas (68%) with poor infrastructure like electricity upon which the 4IR is dependent, the lack of resources has been the reason for the almost stagnant state of rural education in Zimbabwe. WOZA (2009) revealed that from 2008, teachers left in large numbers to other countries to seek ways to survive; during this time some schools had barely any teachers, and the situation has not improved to date. Also, these schools were experiencing severe economic challenges, which further compounded the problem. Thus, to the majority of leaners in rural schools, the dream of acquiring 4IR skills remains elusive. Availability of computers will not be enough without connectivity, to match the standards of the 4IR. Mwape (2016) notes that implementation of the 4IR cannot take place without structures like computer laboratories and equipment, which come at very high prices; for example, these would include computers, smart boards, tablets and suitable furniture. There is minimal internet coverage in the rural areas, and it is too expensive. Also, the cost of installation, maintenance and security is too dear for schools without sustainable budgets. Usually governments develop urban areas faster than rural and remote areas. Already rural schools face lack of transport and other key resources, and they are still expected to

provide quality education.

In addition, poverty and absence of electricity in rural schools has rendered the aims of the 4IR unattainable. The lack of mind-set change makes it impossible for the acceptance of the new to replace the traditional. Worsening this situation is a lack of time and training to make a paradigm shift. Mwape (2016) explains that this also applies to other countries within developing regions. When teachers have no access to these technologies, they cannot learn how to use them effectively, especially in rural areas where technologies are less likely to be available in their homes (Konyana & Konyana, 2013). This ultimately causes a lack of confidence and negative attitudes towards integrating ICT into teaching and learning. Rather, rural teachers rely on traditional methods of teaching. Difficulties in rural areas hinder schools from attracting skilled teachers.

6. Escalation of Inequality Gaps

The 4IR enhances the inequalities existing in a world of digitalisation where many regions have not passed through the first and second industrial revolution (Prisecaru, 2017). This author further explains that robotics and artificial intelligence erodes humane values such as empathy and creativity, raising moral and ethical challenges. In the 4IR era, salaries are determined by level of education, leading to high social inequalities generated by negative economic and social effects (Stiglitz, 2015).

It is well established that people and societies that benefit the most are those that can afford to buy and are able to access the digital world (Schwab, 2016). Economists, for example Mesnard (2016), point out that since the 4IR has started disrupting labour markets, the biggest concern has become the creating of inequalities. Schwab's (2016) analysis explains that those who gain the most, are the innovators who provide intellectual and physical capital including shareholders and investors, widening the gap between the people depending on capital and those depending on labour. Education, as a consumer of information technologies, is left with no power and opportunity to shape the 4IR to direct it towards their goals.

The lack of financial markets and the lack of credit facilities in rural areas make it difficult for people residing there to fully utilise the few educational opportunities. Absence of a functional credit market disadvantages career choices and restricts the mobility of unskilled workers, widening the gap between higher and lower income citizens, making it difficult for the majority of unskilled workers in rural areas to realise the opportunities of the 4IR.

After the collapse of the economy in 2008, UNICEF (2012) reported that 94% of rural schools faced closure and attendance dropped to 20%. The dilemma of school drop-outs presents severe social and economic repercussions. Schools depend on nongovernmental organisations and donations for funds. Hence, the introduction of ICT in education was aimed at bringing back Zimbabwe's educational glory which had collapsed because of infrastructural deficiencies. In this case, access is an issue not only in terms of the physical contact with a computer and internet connection, but a variety of complements are required to maintain a reliable connection (Autor & Dorn, 2013).

Elsewhere in the developed regions, Cook et al. (2016) emphasise that since learners constantly use ICTs to communicate and access information, their learning experiences become irrelevant when they do not include these. They further explain that global collaboration can be used as a vehicle through which to develop communication, collaboration, critical thinking and problem solving which are core to producing adaptable graduates for the global market.

7. Silo-Based Approach: Disconnect Between Curriculum and Education Management

The 4IR requires education management that is largely detached from the curriculum setup. Implications arising for education institutions include making the 4IR useful. To achieve quality education, education systems must choose artificial intelligence options that are the most valuable

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and important (Butler-Adam, 2018). The fact that current 4IR systems are based on European and American norms in terms of language, accents, facial features and others, means that they do not accommodate African environments and therefore require de-racialisation and revolutionising, which in turn requires further research and interventions. From another perspective, learners who specialise in science, engineering, technology and mathematics (STEM) need to learn about the political and social world and vice-versa. How artificial intelligence works requires the curriculum to be restructured.

Going back to the commissioning of The Nziramasanga Commission of Inquiry into education and training in 1999, one of the recommendations was, that the state should transform its education curriculum and provide digital equipment in schools so that learners could acquire relevant skills in the technological era (Konyana & Konyana, 2013). Unfortunately, after the commission there was minimal response, mainly because of political and economic instability. The 2015-2022 updated curriculum was one of the responses coming after sixteen years. The education sector has not been given the attention it needs, prompting an investigation into the relevance of current curriculum in the 4IR. Modern times require curriculum changes – curriculum cannot remain static when society is constantly changing. Progressive societies' curricula are not static, they permit change – change is inevitable in the 4IR.

The literature shows that since independence in 1980, curriculum reform in Zimbabwe has been on a piecemeal or gap-filling basis (Tarisayi, 2010). Konyana and Konyana (2013) warn that curricula produced in such circumstances is undoubtedly disjointed, lacks organisation, has limited rationalisation, and therefore risks passive resistance or rejection from the beneficiaries. For instance, the introduction of computer science in secondary schools as a subject with no support, no electricity, no computer labs, no qualified teachers, no content and no syllabus, has caused a mismatch between existing curriculum and the new subject and to a large extent has escalated the already inaccessible education to rural schools. As reported by Konyana and Konyana (2013) in their study in rural areas, schools had to expedite electrification of a single block of classrooms so as to access electricity. Such schools were not prepared for the ICT programme and had not received computers. Schools had to improvise without any budget.

Other scholars, for example, Saunyama (2017), have described the Zimbabwean curriculum as too academic and insufficient to develop human capital that is required for the current 4IR. Success of technological advancement relies on the political will to commit to the design, organisation and implementation of the programme. The inconsistencies in the government ICT policies exclude rural learners. Given the economic status of the rural communities, rural schools cannot fund the ICT programme. On top of the acute infrastructural limitations and the too expensive data, the government stifles Internet access, further widening the digital divide (Saunyama, 2017).

In his study, Rupp (2013) laments that political instability, affecting good governance infrastructure, as well as corruption, mismanagement, lack of funding, neglect and brain drain have had serious consequences on institutional capacity. These stand as barriers to participation at global standards. In addition, the education management structures have been established in such a way that they act as silos where information flows from top to bottom, and their needs cannot be satisfied by new technologies passed to them for implementation. Moreover, management lacks experience with technology, which may lead to inefficiency in how ICT structures are operated and managed creating a serious systemic challenge.

8. Inability to Contextualise Emerging 4IR Concepts

Innovation of new technologies is moving at a tremendous pace. Developing countries like Zimbabwe have not developed the capacity to deal with the demands of the 4IR. They are lagging behind developments of the 4IR, and still dealing with the second and third industrial revolutions. Yet, the 4IR is impacting each sector in all dimensions.

In 2018, the president, Mr Mnangagwa, launched smart e-learning kits at a Harare girls' high

school that were donated by a Rwandan organisation – Devtech, which comprised 40 tablets and an overhead projector (The Herald, 2018). The question is, how much can the state rely on donations and how much is the education system able to ground the technologies produced, according to other environments within their own ethics, tradition and context. It cannot be contested that a lot of time is lost when teachers try to familiarise themselves with new technology. Furthermore, the 4IR is designed according to the global mobility context and localisation in terms of needs, but settings are not considered as described by Autor and Dorn (2013). They further explain that it is important to adapt the software according to the local culture, traditions and religious values. Failure to do that especially marginalises rural populations, who might be intimidated by the 4IR as a whole.

As the 4IR rolls out rapidly, the required focus is given to creating environments suitable for setting up infrastructure, while the delivery process is given minimal attention. For instance, the renovation of classrooms to smart classrooms where smart boards are mounted with safe and secure burglar proofing would be needed, as well as tablets for each student. Schools strive to set up technologies as prescribed but do not consider the suitability to their own environment, in this case, rural schools. Developing countries like Zimbabwe borrow foreign models of the 4IR in education and strive to fit them as they are into their own systems. The ideas and strategies taken from developed countries will most likely fail to transfer effectively to the environment of developing societies, more still rural areas. The same results cannot be expected from the 4IR in education using the same model, for example, systems modelled in the UK and then applied in Zimbabwe. Rural learners have not laid their hands on a computer, and what they need are basic computer skills, yet they are expected to use computers substantively. Different contextual factors – institutional, demographic and technological factors of individual countries – impact on the programme differently (Nawazi & Kundi, 2010). As a result, projects in which learners and teachers have not participated are imposed on schools, and a mismatch between implementer and innovator goals creep in. Nawazi and Kundi (2010) conclude that the challenge is more pronounced in developing countries, in this case rural areas, where the issue of demographic differences and diversities are more implicative.

9. Twenty First Century Skills Gaps

Research has established that Africa lags behind the rest of the world when it comes to skills development. Taking it further, Naude (2017) accentuates that the populations of many countries in Africa, are not able to access business schools. In addition, the geographical location of rural schools, the focus of this study, makes teachers more than disseminators of knowledge – for example, they become mentors – which positions the school as a sanctuary of learning rather than mere buildings. However, teachers in rural schools are not adequately trained and schools do not have access to 4IR technologies, even basic ones such as smart phones. Hence, the teachers' proficiency in integrating with the existing curriculum, is not ready for the fast growing 4IR.

There are not enough skills to manage, work and implement the new technologies (Butler-Adam, 2018). Teachers have not developed relevant skills and knowledge to work with technologies. This is explained by Harris, Mishra and Koehler (2009) as technological pedagogical content knowledge (TPCK) which includes ability to use technologies and pedagogical techniques appropriately to present concepts in different ways to meet the learners' needs. Such knowledge encompasses technological expertise - how technology can be used to build on learners' existing knowledge address their learning challenges. As education adopts the 4IR, teachers are required to be highly knowledgeable in technology. Naude (2017) posits that lack of skills and education is what is exposing African entrepreneurship to replacement by automation, prompting the education system to retool its products to prepare for the 4IR. Global manufacturing competitiveness is driven by skills. Further compounding this problem is lower enrolment and completion rates from primary to tertiary education. This has led to low research in science, technology, engineering and mathematics in Africa, and one of the key impacts is poor coordination and collaboration between industry and education. Apart from that, developing countries' economies are not able to cover the expenses of

goals they are not sure to achieve.

According to Canidio (2013), Africa's education system cannot produce labour that matches the technological innovation and therefore continues to support and benefit from capitalisation. The political interference in education (WOZA, 2009) makes it impossible for the private sector to support entrepreneurship to develop skills such as management, which are key in entrepreneurship. Bloom and Van Reenen (2010) argue that their study, which utilised the global dataset, shows that competent managers are able to identify and introduce suitable technology in their work places and continue to encourage sustainable innovations. Hence, the practices of education's leadership significantly determine their systems' products.

10. Discussion of Implications

In consideration of the implications of the socio-economic status of rural schools, a combination of recognition, redistribution and representation is required. The injustices of the three dimensions are complexly intertwined, so much so that neither one is independent from the other (Fraser, 2007). The challenges currently experienced by rural schools, which house the majority of the schooling population in Zimbabwe, impinge on recognition. Distribution of resources in schools and all other issues denying rural learners the ability to complete their schooling programme, are perpetuating the poverty cycle. Society cannot succeed in mitigating poverty in rural areas when social arrangements stratifying society are not addressed. Redistributive policies affect the status and identities of rural learners, as well as their economic position (Fraser, 2007).

According to the World Bank (2014), research in Africa tends to be based on external funding rather than indigenous needs and priorities influenced by the donor community. The implementation of the 4IR in education is a long-time venture that needs to be prepared for. The fact that developing states like Zimbabwe feel the pressure to catch up with world-wide technological advances should be critically analysed. In other words, it could be one of many global systems that have been created in such a way that they are not ready to give room for everyone. Research must critique globalisation and delineate its disadvantages to African societies, otherwise it is a mere shift from politics to socialisation. Policy and decision makers should be given time to domesticate foreign originated models to be able to determine their worth. Rural schools in Zimbabwe still need provision of quality education and coercing them to be at par with the rest of the world totally opposes the values of social justice.

In another dimension, the 4IR places former colonisers of Africa in a dominant position, making it difficult for countries like Zimbabwe to resist. Automatically, Europe and America stand to amass immediate gains, which raises the question as to who is interested in liberating Africa. The policies and programmes do not target the problems of Africans. The 4IR could be a front for colonisation disguised as globalisation. As a developing continent, Africa must introspect and use its own ethical systems to critique the 4IR and find ways of creating its own systems without devaluing its people.

Given the infrastructural deficiency in Zimbabwean rural schools, technology disrupts the existing status quo, and therefore demands new skills, budget, time, space and a change of mind-set. In addition, the economic malaise gripping Zimbabwe is leading to de-industrialisation at a time when the rest of the world is entering 4IR needs to be theorised. It is against this backdrop that current debates are on whether countries like Zimbabwe can think of the 4IR when they have not even experienced the second and third revolutions. Further, political instability could derail the 4IR implementation for instance the shutdown of internet services early in 2019 is a reminder of the extent to which 4IR is seen as being at the mercy of the politicians.

Teachers and learners cannot receive once-off training, but require a sustainable system of continuous and uninterrupted support. In their study, Autor and Dorn (2013) warn that the value of establishment of 4IR into teaching and learning is improving access to education, especially in marginalised rural schools. The present challenges in the Zimbabwean rural schools need distributive perspective of social justice which has proved to attract attention within equity and education policy

and practice for a long time (Keddie, 2012). In order to pursue social justice, the Zimbabwean government must frame its policies within this perspective, especially because the inequitable distribution of resources in schools perpetuates inequalities so that poverty and school drop-outs are creating bottle necks for future economic and social inclusion (Keddie, 2012). A complete distributive approach will take into consideration the constraints of rural schools. In other contexts, a study by Rupp (2013) identifies constraints to implementing ICT in education experienced in other African states like Zambia, South Africa, Nigeria, Kenya, Tanzania and Uganda which are: lack of financial resources, limited bandwidth, inadequate human resources, limited electricity, lack of appropriate educational content, poverty, lack of prioritisation of sustainability, lack of leadership and instability and lack of security. Good governance should be able to bring the private sector on board to help develop products that match the rapid growth of technological innovations. This is also reported by Canidio (2013) who established that the public education system in Africa is struggling to respond accordingly to the new labour demands, hence the private sector can assist with curriculum reform, apprenticeship, on-the-job training, as well as funding. All the same, the government must demonstrate commitment in developing rural areas; its presence must be visible. Policy must be shaped by challenges endured by rural schools on the basis of social status, alongside matters of economic distribution (Keddie, 2012). The government must prioritise funding for education, especially models for science, technology, engineering and mathematics (STEM). Schwab (2016) recommends investment in robotics, data analysis, software developers, health science and industrial engineering in order to sustain the economy. These and other skills, including social skills, are required in entrepreneurship.

Another major shift in education is emphasised by Naude (2017, p.16) as the need for "complex solving skills: creative skills, social skills including management, leadership, change management, collaboration, critical thinking, curiosity and risk taking, communication, marketing and sales", which are central to entrepreneurship. The starting point will be to train teachers to be equipped with problem-based methods and shift away from rote-learning; retooling teachers with science and mathematics, attaching them to mentors and specialists in STEM, introducing entrepreneurship subjects, economics and management across all schooling levels and introducing business schools which promote multi-disciplinary and trans-disciplinary approaches, paving the way for life-long learning.

Another area that needs urgent attention is retention of human capital. Zimbabwe must protect its products so that they are not attracted to conditions in other countries; that is, through nurturing a conducive environment to build up and preserve Zimbabwean knowledge economy. These include providing housing, transport, social amenities, safety and security, developing rural areas and improving public utilities so that native products are attracted to remain working in their native countries. The state of rural schools as reflected in the statistics provided in the third section, signifies an unjust society, as Fraser (2007) clearly explains that justice requires parity across all axes of social differentiation. If the industrialised countries have achieved economic advances through technology and organisational innovations, developing countries may make the same achievements if science and technology are readily recognised as a way of accumulating wealth and improved standards of living, especially of rural schools that have remained under-served.

Relevant content coupled with simultaneous high-speed connectivity is a must in the rural areas. Government should set up the requisite infrastructure together with digitised education tools in rural areas. These should be supported by policies that reflect the interest of all stakeholders – that is, learners, teachers, leaders and communities – so that all are informed about developments in education (Madangopal & Madangopal, 2018). In addition, they need to provide adequate funding and professional development of staff. Given the nature of rural areas, grass roots community involvement is a central factor in the access to education which may transform the rural schooling experience. As long as the economic structure of society disallows rural schools the resources they need to access education, it institutionalises social stratification and misdistribution (Fraser, 2007). Similarly, the status order of society disempowers rural inhabitants and they are not recognised as

full partners in society because of their social-economic status, as well as their remote location. Thus, the government must serve its population equally and remove social arrangements violating the requirements of social justice.

This study concurs with Naude (2017, p.16) in terms of social protection mechanisms including "unemployment insurance, basic income grants, pension system, business insurance and credit schemes", so as to promote economic transformation and social inclusion. Related to this will be the means to provide workers with access to finance so that they are able to pay for the education of their children, given that education is costly and arguably growing more and more out of their reach. Thus, the key aspect of education reform in Zimbabwe will be to prioritise accessibility and funding of education at all levels, revising the curriculum to be oriented towards the 4IR, domesticating technological innovations in their own context and tradition and guarding against automation. At the core of achieving this is good governance.

11. Conclusion

Despite aspirations of digitising education in Zimbabwe, there is still a huge infrastructural deficit further complicated by unclear policies, making it almost impossible to translate theoretical approaches into practicality. Effectiveness of all education reform and development policies has been undermined by a lack of political will to steer them in a clear direction and purpose. This has meant that access to technology which will enhance teaching and learning in rural areas remains a dream, especially when they are still grappling with basic infrastructural issues that are already denying accessibility to basic education. Whilst Zimbabwean rural areas cannot be excluded from global technological society because of its implications, it is important to bridge the technological divide by instituting policy and regulatory environments, structural frameworks and capacitate teachers, in order to foster information flow, innovation and utilisation of the global knowledge economy in every aspect of sustainable development.

Thus, with underdevelopment of rural schools, the 4IR poses more challenges than opportunities. The main challenges are inequalities in terms of underdevelopment in rural areas, poverty and families residing there cannot afford technologies making it impossible for rural learners to benefit from the 4IR. Zimbabwe needs to invest in education by distributing financial and human resources uniformly. Government needs to revamp its institutions to nature STEM skills and problem-solving skills; they need to set up business schools and training and vocational education colleges oriented towards the commercial sector. These steps will create a conducive environment for protecting the knowledge economy, human capital, monitoring an effective social protection system and availing educational funding to rural inhabitants for rural learners to access education. Policy makers should consider ways of improving the institutional and governance structure of the Zimbabwe education system to equally distribute resources as social justice advocates. Without access to education, the rural population is excluded from mainstream economic and social development.

Besides inadequate infrastructure in rural schools, the purchasing and maintenance costs serve as a deterrent to this digital revolution. The government should work on limiting constraints in order to allow for the expansion of education in rural areas where the majority of the people are living. Education is not inclusive when there is acute deficiency of teaching and learning resources, limiting development of human capital who can learn skills badly needed for the socio-economic transformation of the country. Therefore, it cannot be contested that it is not the technology that brings the challenges, but it is the human, social and political impediments that make or break the opportunities and initiatives of the 4IR. As is, the status of rural schools do not reflect the values of social justice. Indeed distributive, recognitive and representative approaches have a potential to enhance access, participation and performance of rural learners.

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