



Dimensions of the digital economy in selected African countries: A case study of artisanal gold mining

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Abstract

As the fourth industrial revolution begins and amid an uneven ground of its developmental path, the world sees the realities of digital economy and impact thereof, like never before. Digital economy has influenced the way companies conduct businesses both internally and externally by impinging the life of the most important assets of the company i.e., the informed personnel. Online opportunities have made a significant difference in profit-making and networking of people by impacting their lives economically. Failure to access information, therefore, is detrimental to business networking and marketing as much as it stops the sharing of valuable business information. It is worth noting that the digital economy comes at a price as cybercrimes and political interference counterbalance its positive influence on other aspects of the economy. This paper considers the effect of digital economy as it plays out artisanal gold mining sector in Tanzania and compares it in other African countries.

Keywords: digital economy, digital democracy, digital dictatorship, Tanzania, economic growth

Introduction

Digital economy in recent history has been on the rise since ‘the Arab Spring’. Online communication has allowed would-be strikers to organise and mobilise for political revolution, however, it had a limited positive economic impact (Gopaldas 2019) ^[6]. The United States (US) Department of Commerce first used the term (digital economy) in its 1998 annual report (Kim 2011) ^[11]. Other reports have shown that the word digital economy was coined out by other authors (Tapscott n.d). However, the main difference between digital economy and Information Technology (IT) driven economy is that digital economy encompasses knowledge-based and IT aspects in addition to the main factors of production, namely; labour, capital, and land (Kim 2011) ^[11].

Many authors differ on the definition of digital economy and agree that there are several (Kituyi 2019) ^[10]. The digital economy is known as the internet economy or data-driven economy and is about computerised operations (United Nations 2020). Although there are more definitions, suffice it to mention that for the purpose of this paper, this definition has been singled out as more appropriate.

The digital economy brought forth new terminologies and concepts such as digital citizenship, digital market and so on. Digital citizenship is a recognition of people who have acquired dexterity in computer and technology operations and therefore contribute positively to creating and consuming digital contents. In this way, digital literacy has contributed to socio-economic development. Since the inception of digital literacy, digital use has affected the economy on the positive side just as it has impacted the “digital citizens” on a personal level (Sagan n.d).

The primary objective of this paper is, therefore, to examine the influence of digital economy in selected African countries on gold mining in: Tanzania, the Democratic Republic of Congo (DRC) and South Africa and make comparisons where necessary. The paper first addresses digital economy in Africa then goes to tackle the issue in regions and specific countries. It then uses Tanzania as a case study to further elucidate the construct before concluding.

Literature Review

Comparing digital economy dimensions in African countries

Africa has experienced both digital democracy and dictatorship like the rest of the world -recently authoritarian leaders have abused the freedom digital can offer. The digital economy has a number of properties such as the digitalization of core economic activities, namely production, distribution, and consumption of goods and services...not only does the ICT-based digital economy affect the economic area, it also brings about all-round social change (Kim 2011) ^[11]. Gopaldas (2019) ^[6] and Shahbaz (2018) ^[16] contrasted ‘Digital dictatorship and digital democracy’ as it plays out in Africa and found the difference lies in how digital technology is used either to ‘empower the citizens, topple dictators or as tools of oppression and discord’.

In the East African Community (EAC), the digital economy is a reality as the citizens rely on mobile phone payment systems such as EcoCash and M-Pesa in certain remote areas, and this has a bearing to their economic activities. Mobile phones will continue to impact Tanzania, the DRC and Sub-Saharan African Countries in gold mining business just as they will

across other sectors. Internet shutdowns have cost sub-Saharan Africa about \$237 million since 2015 (Gopaldas 2019)^[6].

Bih Shufor Fofang *et al.* (2019: 3-15)^[3] states that over the past ten years, the continent has recorded the highest growth globally in Internet access from 2.1 % in 2005 to 24.4 % in 2018...the “mobile economy” accounted for 6.7 % of the overall GDP in Africa in 2016, representing USD 153 billion. This is forecast to reach 7.6 % (USD 214 billion) of the overall African GDP this year.



Fig 1

Figure 1 digital dictatorship insights and shows how it affects digital economy. Most internet restrictions and shutdowns happened in Asia and Africa. There were reported to be 185 Internet shutdowns globally in 2017, well above the 108 counted the previous year.

Africa is doing well on digital finance with Kenya and Tanzania taking the lead in the East African Community (EAC) – through M-Pesa started in Kenya for mobile money transactions (Bih Shufor Fofang *et al.* 2019: 3-15)^[3]. Uddin (2018) studied the phenomenon of bit coin (an independent digital payment system) which remains to date controversial. While “Japan has recently made it a legal form of Payment”, China remains sceptical about it (Uddin 2018: 2)^[20] just as the rest of Africa does. In fact, China went further to outlaw crypto currency exchange altogether. However, because for the first time Bit coin price exceeded the price of an ounce of gold in April 2017, people might think that the business has some value in it (e.g. digital currency).

In the great lakes region, in the DRC, to compensate for a failing system in place after decades of the dictatorship by government officials, the people have been allowed to have limited rights over identified mining sites for subsistence. Thus, in the east (Tanzania for example) where gold is exploited art is anally the people also operate within the confines of the law (Karaki 2018)^[9]. Likewise, the government encourages artisanal gold mining for economic

development. In both the DRC and Tanzania, gold mining remains at the minimum (Reid, Lewis and Herman 2019)^[1].

The United Nation (UN) Secretary-General, Antonio Guterres once said: “New technologies, especially artificial intelligence, will inevitably lead to a major shift in the labour market, including the disappearance of jobs in some sectors and the creation of opportunities in others, on a massive scale” (Guterres 2019: v)^[7]. Gold mining was not immune to the above-mentioned predictions. There have been several emphases on the need to put in place regulations to create a dynamic business sphere and promote digital technologies (Afonasova, Panfilova, Galichkina 2018; Colin *et al.* 2015)^[2, 15]. The African Union could play a role in this regard.

D’Costa and Andjelkovic (n.d: 1) elaborate on digital entrepreneurship programs designed to spur economic activity in knowledge industries” and notify that GDP is influenced by the digital economy especially for countries with broadband. Challenges include the labour-intensiveness as well as the difficulties to provide tools and cater for skills acquisition and transfer within the mining company (Manyika 2016)^[13]. From 2005 to 2013 there has been a remarkable increase in digitisation, from 12% to 14% Instead of digital citizens, this research talks about ‘digital haves and have-more’ (Manyika 2016: 8)^[13] -remarkably no have-nots.

Tanzania case study

Tanzania has a clear policy on artisanal gold mining hence its importance for this study. While the Tanzanian case is characterised by Draconian legislative measures the impact of which has far-reaching pitfalls on societal freedom of expression and limit to opponents’ movability. For Shabbaz (2018)^[16] digital dictatorship is authoritarianism.

Artisanal gold mining is legal in Tanzania as from 1995 (while further amendments were conducted in 2010 to allow artisans more flexibility). Mutagwaba *et al.* (2018)^[14] suggest that in the DRC, where artisanal mining is allowed for subsistence reasons, it still poses some problems. There have been instances where the government incarcerated artisanal miners who operated in areas not authorised.

The research raised some policy issues. The export of the gold itself was the main issue. The export tariff has gone from 3% to 7% changing the local dynamics altogether, this led to small players being marginalised. The tax increase had another bearing, it made smuggling more prevalent, thus it became hard to make profits (Mwamba Company profile 2019)^[19].

Digital technology could improve services in such companies. The evolution of network economy from the digitisation of the economy has been positively impacting the lives of people (Bih Shufor Fofang 2019)^[3]. However, there has been reports of negative impacts. For instance, in Tanzania, the government clampdown on internet users by imposing stringent regulatory requirements beyond the affordability of ordinary Tanzanians (for example the requirement to pay a controversial \$924 licencing fee) was, however, an attempt to dictate what and who internet serves. Researchers have termed this: ‘hard digital dictatorship’ (Gopaldas 2019)^[6].

Around 1.5 million artisanal small-scale gold miners (ASGMs) in Tanzania are poor and could not afford modern gold-processing technology. These are also unable to fully be

productive as they skip digital economic costs. Only 40% of ore's gold contents are captured and this occurs in manners that defy environmental regulations and are detrimental to miners' health. About 19 million people depend on mercury in gold processing among 70 surveyed countries (Mwamba Company Profile 2019) [19]. Digital technology could allow networking and the dissemination of information among miners and mining stakeholders. From the above, it is worth

noting as well that Carbon-in-pulp (CIP) technology could improve productivity despite the costs that only Multinational Mining Corporations (MNMCS) can afford. It is estimated that modern technology with the support of digital (information) systems could raise productivity to 98% of contents captured. Digital means of communication and computerisation could enhance the ability of gold mining companies to do this type of business in Tanzania (Isheloke 2019) [19].

Table 1: Gold mining processing, CIP and beneficiation

Phases	Operations	Output
Step 1	Excavation	Dilute gold capturing
Step 2	Manual crushing and hammering	Refined ore with high gold concentration (ppm), 'uncooked' gold (or gold-mercury amalgam)
Step 3	Sale to brokers and beneficiation companies	Refining with borax and e oxyacetylene torch into 18-22k gold ore
Step 4	Carbon in pulp and elution processing	Mercury less processing, elution processing via electrowinning to produce washable gold using acid before smelting it into bars

Source: Mwamba Company Profile (Isheloke 2019) [19].

Table 1 presents in steps what needs to be observed in gold mining processing, CIP and gold beneficiation. There have been mercury exerted in Mwanza (Tanzania) in the open from tailings in excess of 1000 tons each year with harmful effect to health.

Beyond Tanzania, there have been cases of abuses of digital rights as well. China for example has been accused of restricting access to information not only to its citizens but to visitors over the years despite denial (Shi-Kupfer and Ohlberg 2019) [17].

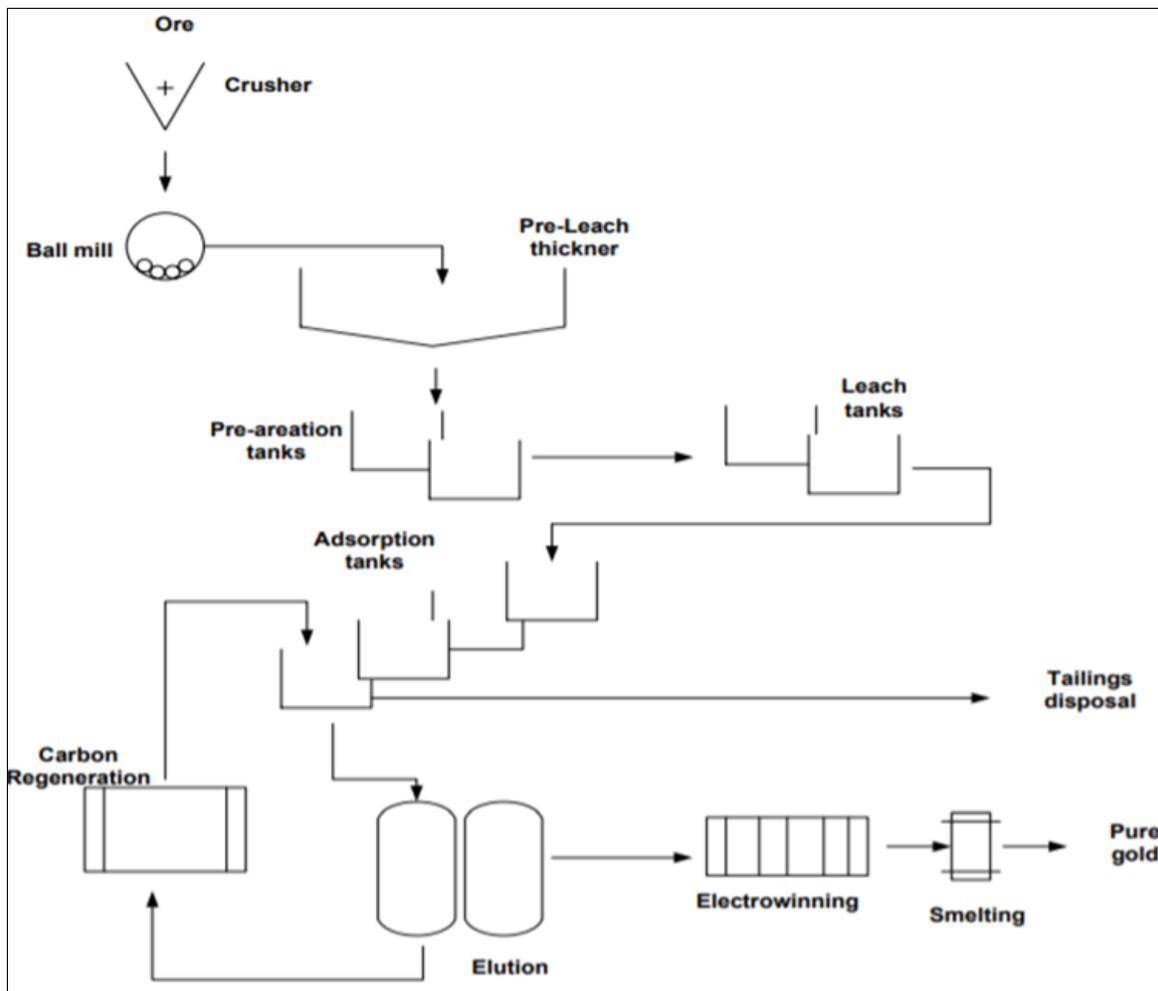


Fig 2

Figure 2: A simplified flow-chart of a gold processing plant highlighting the Carbon-in-pulp section. (Oladele 2015; Mt Todd 2013)

Figure 2 presents in steps what needs to be observed in gold mining processing, CIP and gold beneficiation. There have been mercury exerted in Mwanza (Tanzania) in the open from tailings in excess of 1000 tons each year with harmful effect to health. Companies of this calibre are also vested in digital economic infrastructure which adds to their competitive advantage – small companies, however, do not have the means to fully digitalise their systems.

In artisanal mining, explosives could be used in the support to manual work for shafts digging in parallel to excavation techniques used by Multinational Mining Companies (MNBCs) in order to dilute more gold deposits. Companies of this calibre are also vested in digital infrastructure which adds to their competitive advantage – small companies, however, do not have the means to fully digitalise their operations. This is scalable in other countries across the continent (Isheloke 2019)^[19].

As the demography outgrows the economy in many African countries (Bisseker 2018)^[4] -including but not limited to the DRC, Tanzania, Zimbabwe and South Africa) the people resolve to artisanal mining for survival sometimes outside the confines of the laws in their country. The more the population is poor, the more they resolve to artisanal mining – which is a poverty-driven practice. Usually, people who mine artisanally do not have computerised systems in place to support operations. This has a negative bearing on the people, the business and the economy.

Block chain protocols (that record transactions and verify their footprints to ascertain whether they are not blood minerals), green practices and infrastructure development (including digital/computerised system) could remedy significantly the situation. The power of digital infrastructure resides in its ability to enhance networking between and among stakeholders and by so doing possibly increase productivity by 400% - this which would be a very significant economic impact to Tanzania. The ASGM Bloc kchain technology built using Resource Event Agent (REA) accounting principles. Other devices needed in a gold mining company are for example a magnetometer and ICTs (Isheloke 2019)^[19].

The digital economy is a reality today and it has revolutionised our businesses despite its relative newness and benefits to the elites hence the need for inclusiveness going forward (Guterres 2019; WTO 2019)^[7]. Kituyi (2019: 1)^[10] insinuates that Value creation takes place as soon as data is transformed into useful information (also known as ‘digital intelligence’) for which customers are ready to pay. Traditional concepts about economic development are transformed by digital data (Watanabe *et al.* 2018: 1-2)^[22]. Tanzania had regulated artisanal mining, partly due to the fact that the government acknowledges the role mining plays in alleviating poverty. Rather than gold being declared and taxed as it leaves the country, it will be possible for this to happen at the processing centres.

Kituyi (2019; Watanabe *et al.* 2018)^[10, 22] corroborate with Guterres (2019)^[7] on the positive impact of the digital economy, and the former author points out to the way

developing countries are left behind on the phenomenon. He further agrees with him on the challenges posed, as a result, hence the need for policy experimentation by decision-makers (Kituyi 2019: 8)^[10]. It emerges that the big data or digital data aspect of the digital economy is at the centre of it. Unlike other authors, Kituyi (2019: 3)^[10] links the digital economy to SDGs and suggests it is solution-driven.

GIBS (2019: 2-3) is of the opinion that digital systems unlock business opportunities in a very significant way. It is however indicated that technology could be disruptive both at global and local levels hence the need for care and preparedness. Kituyi (2019: 11-12)^[10] states that developing countries have become markets for worldwide digital platforms generating value and profits. It is obvious that rules and regulations (laws and policies) need to be in place globally and locally for the digital economy to be impactful to all (WTO 2019; Bih Shufor Fofang *et al.* 2019: 3-15)^[3].

The ‘Osaka Declaration on Digital Economy’ is decisive to some extent. Manyika (2016)^[13] examines the digital economy holistically by looking at both opportunities and challenges in addition to trends. This source informs that there is “more to come as more technologies (mostly digital) continue to transform the economy” (Manyika 2016: 3)^[13].

There is an agreement on the speed of the digital economy and its influence on economic growth. Digital economy promotes a knowledge-based society. The fourth industrial revolution (an era where digital system – or ICT- is a reality), economic growth outgrows such in the traditional industrial economy (Kim 2011)^[11].

Tsyganov and Apalkova (2016) also recognise digital newness and informs that it is a 21st-century making. Legislation as well has been used in certain instances to restrict or prevent access to the internet in countries such as Uganda and to some extent in Tanzania. The controversial new levy in Uganda obliging social media to comply or find itself acting against the law is one clear example. The claim by the government to use the revenues collected in this manner for social spending cannot justify the human rights abuses or depriving people the right to access information (Gopaldas 2019)^[6].

The digital economy is enabled with technology platforms, namely the Internet, electronic devices (Cell phones) for the business of goods and services in general (Afonasova, Panfilova, Galichkina 2018; Tsyganov and Apalkova, 2016; Balcerzak and Pietrzak, 2017)^[2]. The Internet has generated the digital economy for which Finland and Singapore are leading. Part of the challenges includes the decline in productivity, ironically during the digital era in industrialized countries. This could be due to the much-needed transition from internet to a digital system of operations (Watanabe *et al.* 2018)^[22].

Nicolas Colin *et al.* (2015: 1-2)^[15] speak about a progressive digital technology and mention its wholeness characteristic. It goes without saying that challenges include joblessness as a result of the digitalisation of the means of production. Soon after the Internet was in vogue, smartphones came into play and made a huge difference in gold mining communications.

While positive aspects of social media remain the ability to foster accountability and transparency between citizens and their governments and improve service delivery through

‘GovTech’ and ‘Civic Tech’ initiatives such as Akshaya in India or M Survey 7 in the DRC, which allows citizens to monitor budget meetings, there is now a huge risk of negative effects. Indeed, in the wake of the scandal over the misuse of user data by Cambridge Analytica, Facebook has been branded a threat to democracy (Gopaldas 2019)^[6].

The digital economy is also giving rise to legitimate concerns regarding the future of employment: apart from its impact on certain professions, it is causing structural changes in the distribution of employment and bringing the long-term rise in the salaried workforce to an end (Nicolas Colin *et al.* 2015: 1)^[15]. Watanabe *et al.* (2018: 1-2)^[22] states that ‘the digital economy is transforming the traditional concepts of economic growth’. Nevertheless, the size of the digital economy is said to range from 4.5 to 15.5 per cent of world GDP...there have been an increase of Global employment in the ICT sector amounting to 34 million in 2010 and to 39 million in 2015, with computer services accounting for the largest share (38 per cent). There could be a share of the ICT sector in total

employment (Kituyi 2019: 4).

Research methodology

This research is qualitative in nature. It is a desktop study that follows hermeneutics as a methodology. It allowed a literature survey to take place systematically to produce the current results. Hermeneutics deal with symbols, signs, texts as it happens in business economics research and application thereof. As a methodology, hermeneutics seeks to decode the hidden meaning of economic texts. Suffice it to state that this study embraced economic semiotics as a metatheory. It seeks to increase logic of economic science by presenting the history of the research, and studying what texts hide within (Băileşteanu and Lungu 2012). Berger (1989) links hermeneutics to economics and suggests it is suitable as a methodology.

Research findings

Table 2: Digital economy affected by digital dictatorship

Country	Abuse of rights to information	Impact beyond politics
ETHIOPIA	Internet access was shut completely down in three consecutive years in 2017, 2018 and 2019	Business losses; human rights abuses
UGANDA	The government imposed a new social media tax to restrict access to messaging platforms in 2018	Discrimination based on the purchasing power; human rights abuses
DRC	“Internet shut off during the 2018 election and remained unavailable amid claims of electoral fraud in 2019”	Human rights abuses
ZIMBABWE	In 2019, the government of Mnangagwa cut off access to the internet and social media in Zimbabwe	Human rights abuses

Source: Gopaldas (2019)^[6], adapted by the researchers.

Table 2 digital dictatorship insights and shows how it affects digital economy. Most internet restrictions and shutdowns happened in Asia and Africa. There were reported to be 185 Internet shutdowns globally in 2017, well above the 108 counted the previous year.

Beyond Tanzania, there have been cases of abuses of digital rights as well (Shi-Kupfer and Ohlberg 2019)^[17]. Where democracy is still an issue in Asia and Africa, internet shutdown cannot be ruled out as yet (Gopaldas 2019)^[6].

Table 3: Some Statistics about artisanal small-scale gold mining (ASGM)

Activity	Facts	Possible Source
Artisanal small-scale gold mining	15-18 billion US dollar a year industry	UN
Global gold supply	12-15%	Mwamba Company Profile
Environmental impact	1400 tons of mercury released into the environment – terrible mercury pollution	Idem
Mining artisans	+ 41 million artisanal and small-scale miners in 70 countries	Idem
Market share in Tanzania	TZ Annual exports reach \$224 million USD but account for 1.2% of ASGM market share	UNECA

Source: Isheloke (2019)^[19].

Table 3 demonstrates with statistics the importance of ASGM. It is deemed that Tanzania account for 3.75% of global small-scale artisanal gold miners but its output is only 1.2% in terms of global production (TZ has reportedly almost 1.5 million artisanal miners in its territory). It is argued that if the industry invests more in digital economy (through capital and processing infrastructure as well as the computerised system), it can see artisanal gold production enhanced. Currently, the lack of proper distribution channels, the reliance on mercury as well as the non-availability of information systems (digital and e-documentation...) is a cause of frustration in mining –

Company X is, therefore, an exception.

It was reported that: “Internet subscriptions declined by more than 2.5 million users (from 16.1 million in July to 13.58 million in September 2018), while the sum of taxpayers from OTT media services decreased by more than 1.2 million users” (Gopaldas 2019)^[19].

Conclusion

This paper examined the dimensions of the digital economy by looking at both its positive and negative aspects. Examples were given about digital democracy, dictatorship and related

matters. It was suggested that developing countries with democracy challenges find themselves under the digital dictatorship. A number of abuses also took place in developed countries. It is hoped that this study contributes to the bulk of information on digital economy by showing what its impact is. Further studies on the topic in the gold mining industry are encouraged in the future.

References

1. Reid H, Lewis B, Herman W. FEATURE-Gold rush? Not for us say Tanzania's small-scale miners, 2019. <https://www.cnbc.com/2019/10/30/reuters-america-feature-gold-rush-not-for-us-say-tanzanias-small-scale-miners.html> (Accessed 12 January 2020).
2. Afonsova1 MA, Panfilova EE, Galichkina MA. Social and Economic Background of Digital Economy: Conditions for Transition. *European Research Studies Journal*, 2018;21:(3):292-302.
3. Bih Shufor Fofang *et al.* *New Africa-Europe Digital Economy Partnership. Accelerating the Achievement of the Sustainable Development Goals*, 2019.
4. Bisseker C. SA's population is booming and the economy is struggling to keep up. *Financial mail*, 27 September, 2018.
5. D'Costa, Andjelkovic (n.d). *Increasing Entrepreneurship in the Digital Economy*. New York: World Bank Group.
6. Gopaldas R. Digital Dictatorship versus Digital Democracy in Africa. *SAIIA Policy Insights No 75*, October 2019.
7. Guterres A. Preface. In: United Nations. 2019. *Digital economy report: value creation and capture: implications for developing countries*. New York: UNCTAD, 2019.
8. Inman RP, Rubinfeld DL. Understanding the Democratic Transition in South Africa. *American Law and Economics Review*. Available, 2013. [https://www.law.berkeley.edu/files/Am_Law_Econ_Rev-2013-Inman-aler_ahs023\(1\).pdf](https://www.law.berkeley.edu/files/Am_Law_Econ_Rev-2013-Inman-aler_ahs023(1).pdf) (Accessed 03 January 2020).
9. Karaki K. *Artisanal gold mining in DRC: time to get down to earth*. Maastricht: Ecdpm, 2018.
10. Kituyi M. In: United Nations. 2019. *Digital economy report: value creation and capture: implications for developing countries*. New York: UNCTAD, 2019.
11. Kim TY *et al.* *The Faster-Accelerating Digital Economy*. Seoul National University, 2011.
12. Maherry M. Digital transformation pros and cons. *Engineering news*, 19th April 2019, 2019.
13. Manyika J. *Digital Economy: Trends, Opportunities and Challenges*. New York: McKenzie & Company, 2016.
14. Mutagwaba W, Tindyebwa JB, Makanta V, Kaballega D, Maeda G. *Artisanal and small-scale mining in Tanzania – Evidence to inform an 'action dialogue'*. London: IIED, 2018.
15. Nicolas Colin *et al.*, « Économie numérique », *Notes du conseil d'analyse économique*, 2015;7(26):1-12.
16. Shahbaz A. *The Rise of Digital Authoritarianism: Fake news, data collection, and the challenge to democracy*, 2018. Available: <https://freedomhouse.org/report/freedom-net/freedom-net-2018/rise-digital-authoritarianism> (Accessed 02 January 2020).
17. Shi-Kupfer K, Ohlberg M. *CHINA'S DIGITAL RISE Challenges for Europe*. Berlin: MERICS, 2019.
18. Tapscott D. (n.d). *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*. Available: <https://pdfs.semanticscholar.org/a832/0ab8d4a6c0a1d0578c6e01288b03cb00de4a.pdf/> (Accessed on 11 January 2020).
19. Isheloke BE. *Mwamba Company Profile (Unpublished)*. Cape Town: Mwamba Ltd, 2019.
20. Uddin MA. (Bit coin: A hype or digital gold!The *Financial Express*, Tuesday, 2 October 2018, 2018.
21. United Nations. *Economy Report*, 2019. Available: <https://unctad.org/en/PublicationsLibrary/der2019en.pdf> (Accessed 09 January 2020).
22. Watanabe C, Moriya K, Tou Y, Neittaanmäki P.. *Consequences of the digital economy: Transformation of the growth concept*. *International Journal of Managing Information Technology (IJMIT)*, 2018, 10(2)
23. WTO. *Osaka Declaration on Digital Economy*, 2019. Available: https://www.wto.org/english/news_e/news19_e/osaka_declaration_on_digital_economy_e.pdf (Accessed 30 December 2019).
24. Sagan C. n.d. *The digital citizen*. Available: https://us.corwin.com/sites/default/files/upm-assets/34982_book_item_34982.pdf (accessed 03 January 2020).