

# The Use of Big Data in Education: Challenges and Policy Recommendations for Ethiopia

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## Abstract:

The integration of big data analytics in education has garnered significant attention in recent years due to its potential to revolutionize traditional educational practices. This paper explores the multifaceted landscape of utilizing big data in educational settings in Ethiopia, examining its opportunities, challenges, and implications. The paper argues that big data holds immense potential to revolutionize public policy making and implementation in the educational sector in Ethiopia, by placing citizens at the heart of decision-making processes. Through comprehensive data analysis, policymakers can gain invaluable insights into the diverse needs, interests, and preferences of the public, thus enabling a more citizen-centric approach to public service delivery. The paper identifies major challenges such as social, infrastructural and political challenges and concludes by providing recommendations on the way forward.

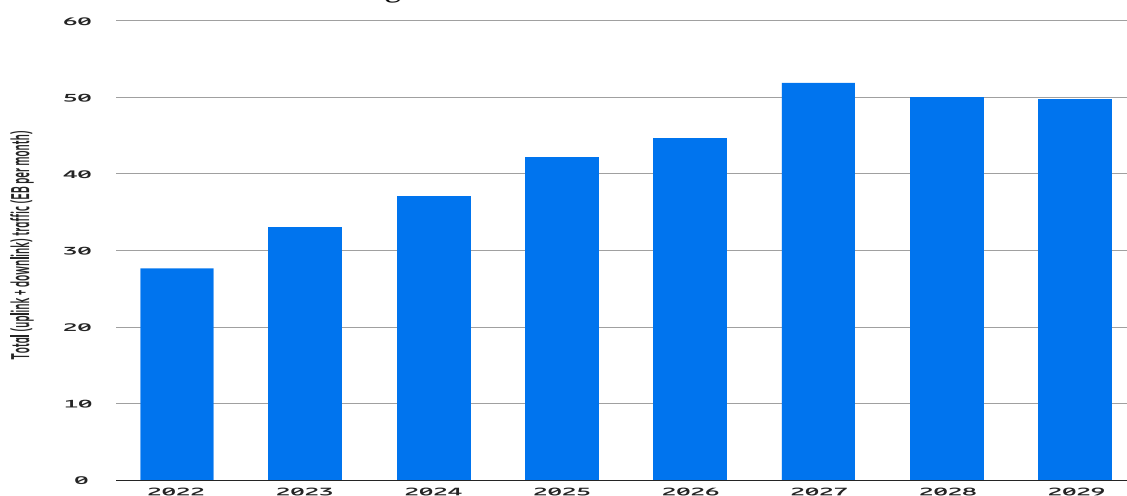
**Key words:** Big data, Education, Ethiopia

## 1. Introduction

In its 2011 edition, The Economist reported a staggering 130 exabytes (equivalent to 1 billion gigabytes) of information generated in 2005 alone. This amount underwent a remarkable tripling by

2015, surging to a staggering 7910 exabytes. The ubiquity of data generation pervades every facet of our daily existence. Harnessing and analyzing this data effectively holds the potential to vastly deepen our understanding of the planet.<sup>1</sup>

**Figure 1: Data Traffic Forecast**



Source: Cisco Visual Networking Index, Global Mobile Data Traffic Forecast, 2022-2029

<sup>1</sup> The Economist, *Big Data: Drowning in Numbers*, 2011

Big data is a relatively new term which describes large amounts of data that may have been there for a while but, due to the internet and increased storage capabilities, are being produced and stored at an accelerated rate. Horrigan described Big Data as “I view Big Data as non-sampled data, characterized by the creation of databases from electronic sources whose primary purpose is something other than statistical inference.”<sup>2</sup>

The UN Department of Economics and Social Affairs has categorized big data into three primary domains: Social Networks, Traditional Business Systems, and the Internet of Things.<sup>3</sup> Social Networks encompass human-generated data sourced from platforms such as Facebook, Twitter, email, and blogs. Traditional Business Systems comprise process-mediated data originating from economic transactions, including credit card transactions, medical records, and e-commerce activities. Lastly, the Internet of Things encompasses machine-generated data derived from fixed and mobile sensors, mobile phone location data, satellite images, and computer system logs.

In the realm of Big Data, the term 'big' transcends mere size or volume; rather, it encompasses a complex amalgamation of data sources, technologies, and methodologies that have evolved to harness the exponential surge in data creation. Big Data constitutes a fusion of structured data—information not easily organized or interpreted by conventional data models and databases—and unstructured data, representing a myriad of formats stemming from interactions between individuals and web applications.<sup>4</sup> Gartner, an American firm known for conducting research on technology, has delineated three critical aspects, termed the three V's of Big Data, to encapsulate its essence: Volume, Velocity, and Variety.<sup>5</sup> Volume underscores the vast quantity of data, often likened to an 'Ocean of data,' indicative of its sheer

magnitude. Velocity denotes the rapidity at which data is generated and processed. Variety shows the diverse nature of the information landscape, encompassing a spectrum of data types and formats.

There is a fourth addition to the three Vs, which is Veracity. Veracity encompasses the crucial aspect of data reliability, accuracy, and utility, particularly given the vast Volume and diverse Variety inherent in Big Data. Ensuring the veracity of data presents a formidable challenge, as the prevalence of 'dirty data'—information marred by inaccuracies, incompleteness, or inconsistencies—poses a significant risk to the integrity of decision-making processes driven by Big Data analytics. Effectively addressing veracity concerns is paramount to upholding the credibility and efficacy of insights derived from Big Data analysis.<sup>6</sup>

## 2. Why Use Big Data?

There are several driving factors behind the increasing utilization of big data. Firstly, efficiency stands out as a paramount concern, and the integration of big data significantly bolsters efficiency levels. Big data capabilities offer an unparalleled potential to comprehend the nuanced needs of customers and the general public, facilitating precise analysis. Decision-makers today necessitate swift access to integrated data and expedited assessments. Traditional methods of data storage and processing, such as surveys and censuses, fall short in meeting the efficiency demands of the modern landscape. This translates into faster and more informed decision-making processes that are finely attuned to the real-time demands of the populace. Moreover, big data presents an opportunity for cost reduction. Despite the challenges of processing and storing vast quantities of new data in data warehouses, the adoption of big data technologies enables seamless

<sup>2</sup> M.W. Horrigan (2013), *Big Data: A Perspective from the BLS*, Amstat News,

<http://magazine.amstat.org/blog/2013/01/01/sci-policy-jan2013/>

<sup>3</sup> *Meeting of the Expert Group on International Statistical Classifications*, UN Department of Economic and Social Affairs Statistics Division, New York, 19-22 May 2015

<sup>4</sup> Mircea Trifu (2014), *Big Data: Present and Future*, Database Systems Journal, vol V, no 1, p 33

<sup>5</sup> Laney, D. (2001) 3D Data Management: Controlling Data Volume, Velocity and Variety. META Group Research Note, 6

<sup>6</sup> Mircea Trifu, supra note 4

data movement to enterprise warehouses as required for analytical applications.

Big data provides the opportunity to make public policy making and implementation to be more centred on citizens on the basis of the needs, interests and preferences of public service delivery. By enabling citizens to communicate their opinions on platforms like social networks, rating the quality of services of the government organ or discussing issues of public policy on sites of civil societies and enterprises, a whole range of data can be generated for government that can be used for a better policy outcome. A clear data can also be collected on people's behaviour when citizens sign petitions and participate in civic engagements. The recent Cisco's Visual Networking Index shows that the volume of data is growing faster in developing countries. While the mobile data traffic grew by an estimated 74% in 2015, the highest growth rate was in Middle East and Africa (117%) followed by Asia Pacific (83%).<sup>7</sup> Between 2022-2029, mobile data traffic per smartphone will grow 22% in sub-Saharan Africa countries.<sup>8</sup>

However Big Data is also technologically challenging for governments. In addition to the greater ICT infrastructure needed, governments have always suffered from shortage of IT skills. In addition, making sense of Big Data and integrating the data for proper usage requires complex data analytic skills which are acutely scarce. A recent survey in private business technology sector indicates that scarcity and cost are the primary concerns in relation to Big Data.<sup>9</sup>

However, Big Data is not just an option right now as we live in a digitalized world. Policy makers do

not have much option but use Big Data while trying to tackle the challenges associated with it. In developing countries there need to be a serious consideration in using Big Data as a tool for public policy making and implementation. This is because the level of digitalization is limited to certain parts of the society and using the data from a specific section might not represent the whole community's policy preference. In addition, testing hypothesis using Big Data sources could result in false confirmation because human beings are better in processing large information, organizing and visualizing it as appropriate.

### 3. Big Data in Education:

Today's education highly relies on information communication technology. The use of ICT in admission system, learning management and assessments has become very common.<sup>10</sup> The use of big data in education would allow to integrate technology into education thereby enabling students in different institutions and the general community to link up and monitor progress.<sup>11</sup> It will also serve in order to identify student needs and interests that could lead to a better educator-student environment.

Knowledge comes in different forms. Data by itself is a raw element and only if it can be patterned in a certain way that it can be transformed into information. Information will be transformed to knowledge which would result in wisdom. Wisdom results in the capability to make knowledge based decisions to maximize value added benefits.<sup>12</sup> In public policy, the wisdom of the government should be manifested in knowledge-based decisions that advance the public welfare.

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<sup>7</sup> Mobile data traffic refers to the volume of data that is moving across a network at any given time. For more, see Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020

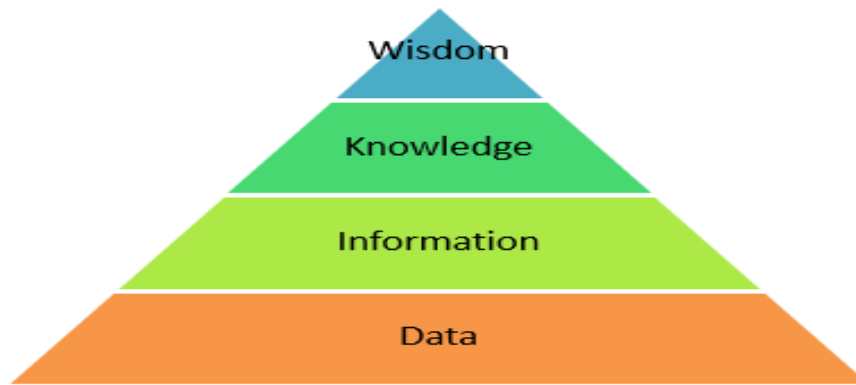
<sup>8</sup> Ericsson, Mobile Data Traffic Outlook 2022-2019, available at <https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/mobile-traffic-forecast>

<sup>9</sup> Patrick Dunleavy et al (2006), Digital Era Governance: IT Corporations, The State and E-Government, Oxford

<sup>10</sup> Center for Digital Education (2015), Big Data in Education: Harnessing Data for Better Educational Outcomes, Issue 3, p 3

<sup>11</sup> Ibid

<sup>12</sup> Samira ElAtia et al, Implications and Challenges to Using Data Mining in Educational Research in the Canadian Context, Canadian Journal of Education, vol 35 no 2, pp 101-119

**Figure 3: The Knowledge Pyramid**

There is limited data concerning the use of Big Data in education sector in general. The recent Final WSIS Targets Review that assessed the progress and developments in information society and Big Data during 2003-2014 shows that there is little information to track progress.<sup>13</sup> In particular, Big Data would enhance the wealth of knowledge and intellectual exchange among higher education institutions by creating a platform through which different institutions and departments contribute to educational data. By storing and coding data accessible to a larger research audience in a format accessible to all, big data allows academics to analyze and modify academic research from their own perspectives. To this effect, the use of Big Data in higher education accelerates the progress of scientific discovery and innovation.

#### 4. Education Sector in Ethiopia

The initial phase of modern education in Ethiopia was in 1940s. In 1941 a new education policy was adopted with the objective of replacing expatriates that were working in public offices at different levels in Ethiopia. With less focus on innovation and vocational training, the ambition of the student population was primarily to secure government jobs. Due to the absence of clear policy framework that provides for evaluation and refinement of the educational sector, the majority of Ethiopian

population were not beneficiaries of modern education.<sup>14</sup>

A comprehensive educational and training policy was adopted in 1994 indicating the directions and general strategies of the educational sector, but without clear indication of the priority sectors. To clarify the priority areas and set clear targets, the government of Ethiopia launched the Education Sector Development Program (ESDP) in 1997.<sup>15</sup> The first three phases of ESDP focused on access and equity in education particularly to make schools accessible to the population. In relation to ICT, the ESDP IV (phase 4) (2010-2015) adopted Science, Technology, Engineering and Mathematics (STEM) as an area of priority in higher education. As an area of priority ESDP IV provides for “*strengthening the capacity for knowledge creation, in particular in the domain of science and technology, through an expansion of access to training and vocational education and to higher education without sacrificing quality.*”<sup>16</sup>

ESDP phase six (ESDP VI) spans from 2020 to 2025.<sup>17</sup> Phase six has six focuses of objectives, which are fostering knowledge and skills, enhancing creativity and thinking skills, inculcating leadership skills through formal and non-formal education, multi-lingual proficiency, national unity in diversity, lifelong learning, and

<sup>13</sup> International telecommunications Union (ITU), *Measuring the Information Society Report 2014*, p 173

<sup>14</sup> Federal Democratic Republic of Ethiopia (FDRE) Ministry of Education, *The Education and Training Policy and Its Implementation*, [http://planipolis.iiep.unesco.org/upload/Ethiopia/Ethiopia\\_education\\_policy\\_implementation.pdf](http://planipolis.iiep.unesco.org/upload/Ethiopia/Ethiopia_education_policy_implementation.pdf)

<sup>15</sup> Ibid

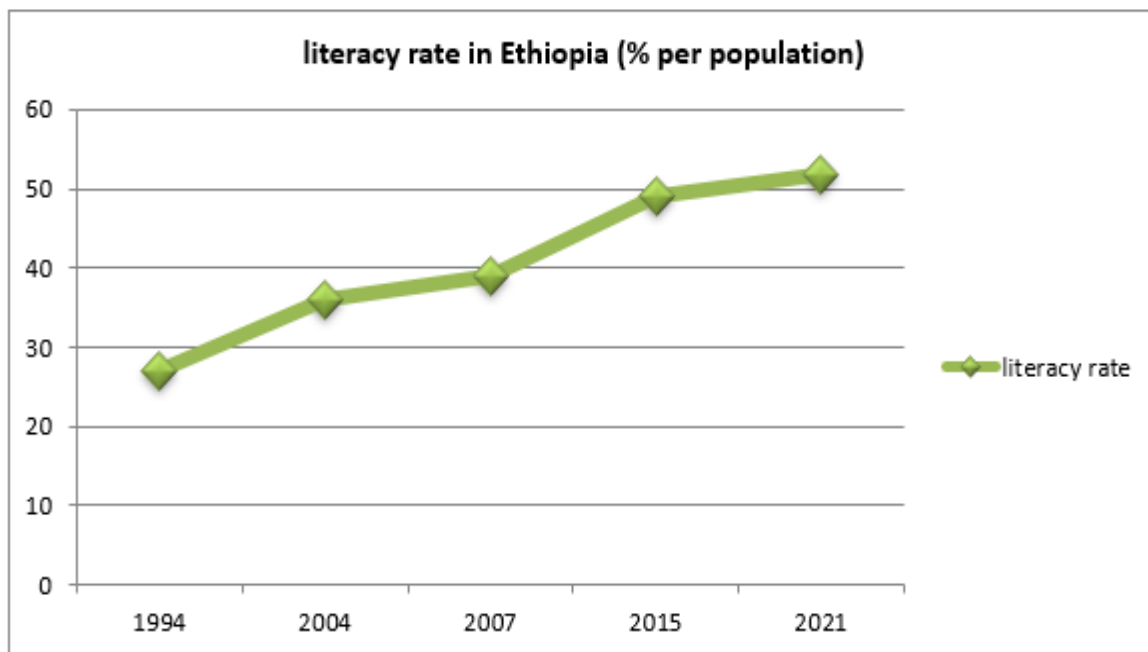
<sup>16</sup> FDRE Ministry of Education, *Educational Sector Development Program IV*, page 8

<sup>17</sup> FRRE Federal Ministry of Education, *Education Sector Development Programme VI (ESDP VI)*, page 30.

physical wellbeing and health. The overarching goal of ESDP VI is to ensure enhanced education and training especially from pre-primary, primary to intermediate level compulsory education, supported by high quality education, science and

appropriate technology. It also aims at enhancing the individual’s mental, physical, social, emotional and positive values, and developing competent citizens who will grow the economy and compete internationally.<sup>18</sup>

**Figure 4: Literacy Rate in Ethiopia 2021**



Source: UNESCO

However, higher education in Ethiopia has experienced a very slow progress in terms of ICT in general. Despite the fact that the role of ICT in the country’s development program is emphasized, the schools, institutions and departments of higher education in Ethiopia are not well connected. The institutions mainly rely on traditional data collection and analysis techniques as opposed to ICT enabled data analytics.

**5. Should Ethiopia Use Big Data in Education Sector?**

The use of Big Data in public policy making and implementation seems to have gained a prominent importance in modern days. The age of Big Data have arrived whether we like it or not. However, there are different factors that determine whether or not the use of Big Data in policy making is effective, if not possible. As the volume of data and sources of data are increasing dramatically, governments will be forced to devise public

policies on data-driven sources. But developing countries like Ethiopia face significant challenges in adopted data-focused public policy decisions in educational and other sectors. The next section discusses the factors that determine the application or otherwise of Big Data in educational sectors in Ethiopia. I will provide criteria and assess the use of Big Data in Ethiopia.

**5.1.Receptivity**

Sources of Big Data as the new sources of information require citizens actively engaged in exchanging ideas, reporting and feedback mechanisms. Receptivity refers to the cultural orientation towards the use of technology by both the government and private citizens. Cultural barriers significantly impact the development of technology in a society. Without active participation of citizens in civic engagement, the use of Big Data for public policy making and implementation is unlikely.<sup>19</sup> Not only should the

<sup>18</sup> Ibid

<sup>19</sup> Forbes, Why Cultural Change is Necessary For Big Data Adoption, 8 November 2016

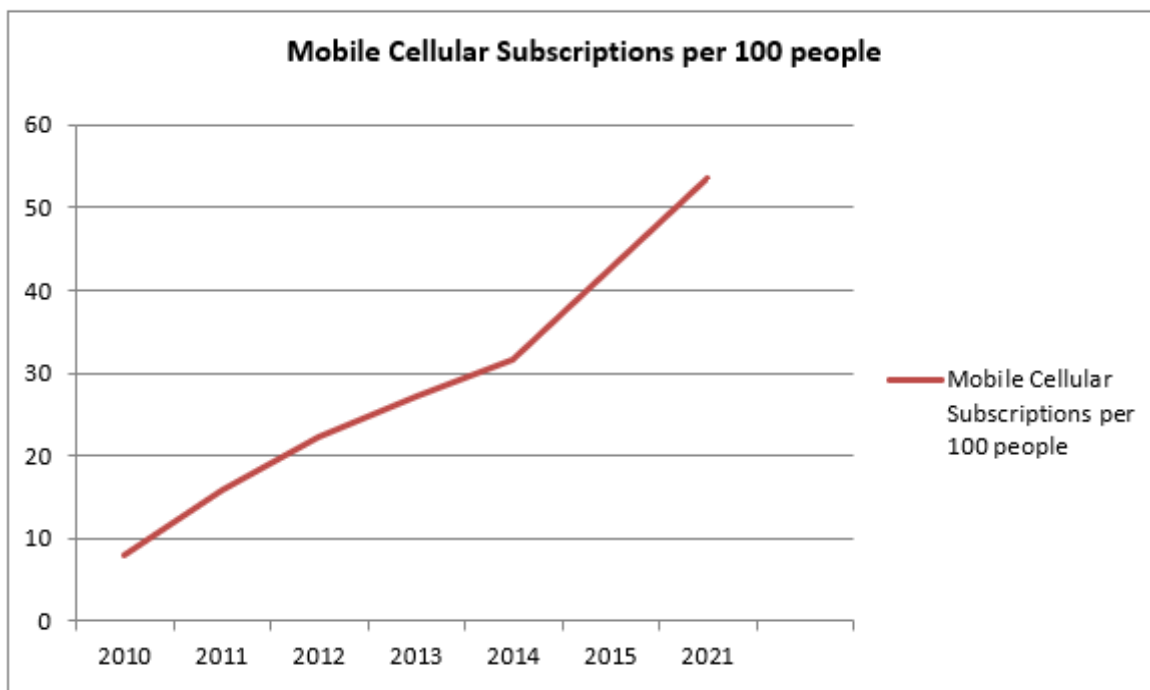
society be receptive to the notion of Big Data but also they should embrace it. When it comes to education sector, the usage of ICT should be entrenched as a key platform of exchange between educators and students. In Ethiopia, only 4.2% of the population are active internet users in 2016.<sup>20</sup> Even though this has to do mainly with the limited access, the culture of using Big Data sources for civic purposes is very limited. A 2009 case study of the Addis Ababa University, the country’s pioneer university, concerning the usage of ICT in education found that only 23% of the teachers use ICT in teaching activities despite the fact that they have access to it.<sup>21</sup> To this effect, the use of Big Data in higher education while both the students and educators are not active user of sources of Big Data leads to undesirable public policy outcomes. Sources of Big Data as the new sources of information require citizens actively engaged in

exchanging ideas, reporting and feedback mechanisms.

**5.2.Capability: Infrastructure**

Among the major challenge of using Big Data in public policy is const consideration. Big Data requires the availability and accessibility of sources of Big Data for citizens. Big Data from the ICT industry, especially mobile telephone access is vital. The recent ITU facts and figures indicates that developing countries now constitute the largest internet users with 2.5 Billion users as opposed to 1 Billion users in developed countries.<sup>22</sup> However, this is not the case for internet penetration rates that remain very low (15% in Least Developed Countries, 40% in Developing Countries and 81% for Developed Countries).<sup>23</sup> Even though Ethiopia is one of the countries with fastest growing mobile users, the relative access remains very low. (See Figure Below)

**Figure 5: Mobile Cellular Subscription in Ethiopia**



Source: The World Bank

<http://www.forbes.com/sites/ciocentral/2016/11/08/another-side-of-big-data-big-data-for-social-good-2/#7468e4b86663>

<sup>20</sup> Internet Live Stats,

<http://www.internetlivestats.com/internet-users-by-country/>

<sup>21</sup> Dawit Tibebe et al (2009), ICT Integration Efforts in Higher Education in Developing Economies: The Case of Addis Ababa University, Ethiopia, International Journal of

Information Communication Technology Education 5(3), pp 34-58

<sup>22</sup> ICT Facts and Figures (2016), Mobile Network Coverage and Evolving Technologies, <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2016.pdf>

<sup>23</sup> Vincenzo Morabito (2015), Big Data and Analytics: Strategic and Organizational Impacts, Springer International Publishing , Switzerland, p 23

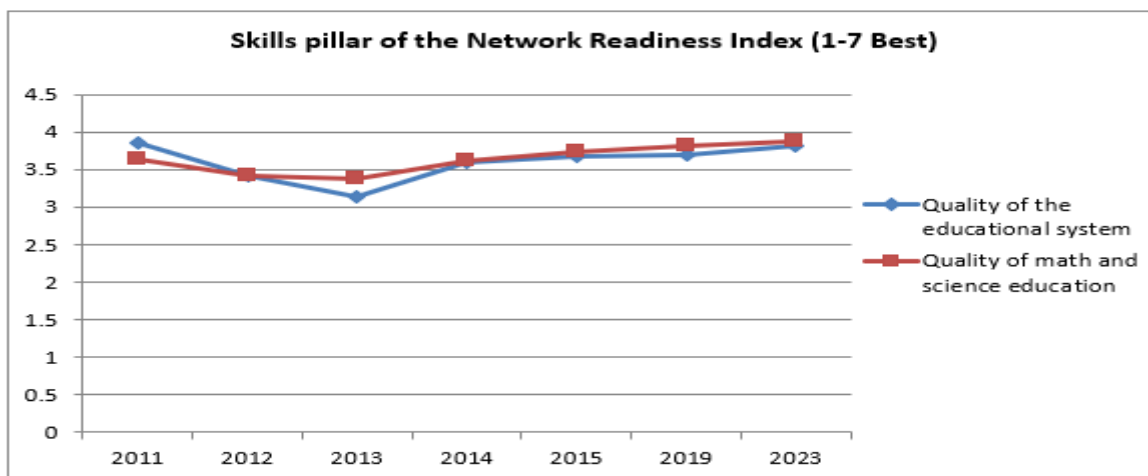
However, the significant growth in mobile cellular subscription is not supplemented by fixed broadband subscriptions. As of 2015, out of 100 mobile cellular subscribers, only 0.658 have fixed broadband subscription.<sup>24</sup> This significantly limits the ability of individuals to actively engage in public governance including the education sector. With such low rate of daily users, the volume of data collected, analyzed and stored for policy making is very insignificant.

### 5.3.Capability: Skills

Big Data requires the development of necessary human power that is well equipped with data

analytics skills. Unless the masses of data generated are collected, stored and analyzed effectively, governments will not benefit from the opportunities it presents. Lack of skilled man power has been commonly described by both the private and public sector.<sup>25</sup> According To the ITU’s 2023 ICT Development Index, Ethiopia is ranked 151<sup>st</sup> out of 167 Countries.<sup>26</sup> In relation to the human development factor, the skills sub-index puts Ethiopia 154<sup>th</sup> out of 167 countries.<sup>27</sup> The skills sub-index, though a proxy indicator, captures capabilities in terms of skills that are relevant for ICT in general based on adult literacy, gross secondary enrolment and gross tertiary enrolment.

**Figure 6: Network Readiness Index, Skills sub-index for Ethiopia**

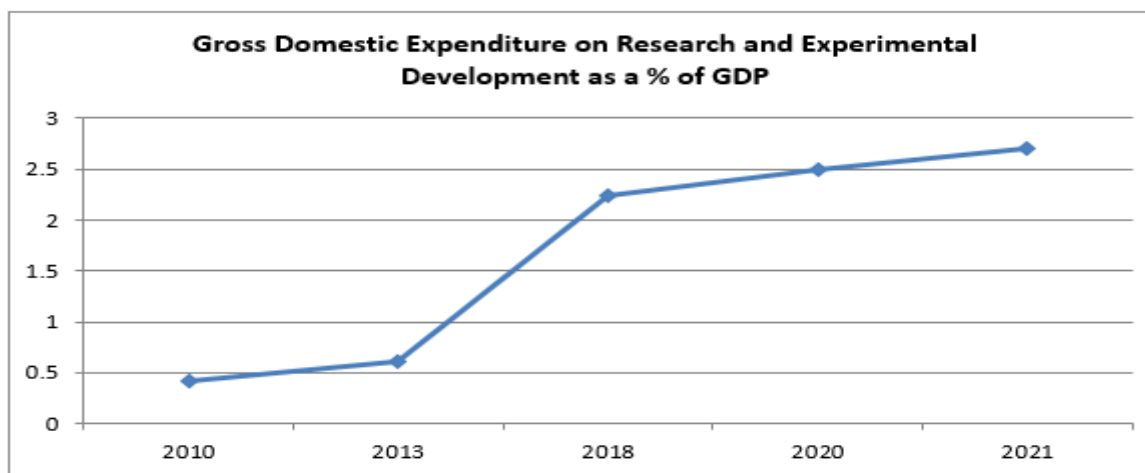


Source: World Economic Forum, Global Information Technology Report, 2023

However, there are positive signs concerning investment in human development on science and technology. Significant resources are relatively

being directed towards research and experimental development to enhance educators on STEM.

**Figure 7: Ethiopia’s Gross Domestic Expenditure on R&D**



Source: UNESCO

<sup>24</sup> The World Bank, <http://data.worldbank.org/indicator/IT.NET.BBND.P2?locations=ET>

<sup>25</sup> Patrick Dunleavy, cited at note 7 above

<sup>26</sup> International Telecommunication Union, ICT Development Index 2023, available at <https://www.itu.int/itu-d/reports/statistics/IDI2023/>

<sup>27</sup> Ibid

This is as a result of Ethiopia’s Education Sector Development Program VI that provided for the government’s commitment to strengthen investment in strong scientific and technological education.<sup>28</sup> This expenditure has resulted in the recruitment of domestic and foreign ICT educators in higher education institutions and establishing computer engineering and coding fields in Ethiopian universities.

**5.4. Political Feasibility**

Another important factor worth considering is the political will of the government to utilize data driven public policy making and implementation. The use of Big Data in public sector in general and educational sector in particular can be determined by the level of openness and participatory governance inherent in the system. While e-governance projects mainly focus on the efficiency side of public service delivery, different Open Government initiatives aim at transforming the transparency, participation and inter-departmental collaboration aspect of public governance.<sup>29</sup> The

**Summary of Criteria**

Criteria	Current Level (Low, Medium or High)
Receptivity	Low
Digital Infrastructure	Very Low
Digital Skills	Very low
Political Feasibility	Low

NB: The measurement from High, Medium and Low are used based on the analysis provided above and in comparison with other countries that use Big Data for public policy making and Implementation

**6. Big Data in Education Sector in Ethiopia: The Way Forward**

As described in the previous sections, the use of Big Data in Ethiopia is at very infant stage. Apart from the policy focus on ICT and initiatives to

use of Big Data by itself presupposes a government system that strives to enhance the role of citizen perception and participation in policy making and analysis. Unless there is a responsive government that can collect, analyze and use the data in order to meet the demands of the public, the political will matters.

On the other hand, Big Data can also be used for nefarious purposes. For a repressive government like Ethiopia, Big Data provides the perfect opportunity for the government know exactly what the citizens are doing and predict what they will do in the future.<sup>30</sup> Ethiopia has built the unfortunate notoriety in censoring the web and using social media to suppress dissent and anti-government sentiment. According to the Committee to Protect Journalists (CPJ), Ethiopia is one of the 10 most censored countries.<sup>31</sup> Taking into account the fact that Big Data in education is meant to facilitate intellectual discourse and innovation, the use of Big Data in the educational system in Ethiopia could result in the reverse outcome.

focus on STEM, there is no clear policy framework. However, the age of Big Data has arrived and faster data traffic is growing in developing countries like Ethiopia. Not only do citizens rely on social networks like facebook and twitter for news and exchange of ideas, the internet of things makes sending and receiving data the daily routine of citizens. In particular, Big Data is essential in education sectors as it would encourage diversity of ideas and intellectual exchange in easier and

<sup>28</sup> Federal Democratic Republic of Ethiopia Ministry of Education, Educational Sector Development Program (ESDP IV): Program of Action, p 14

<sup>29</sup> Vincenzo Morabito, cited at note 19 above

<sup>30</sup> Forbes, This Is Why Dictators Love Big Data. 2 February 2016,

<http://www.forbes.com/sites/bernardmarr/2016/02/02/this-is-why-dictators-love-big-data/#356f9c072fa2>

<sup>31</sup> Committee to Protect Journalists, <https://cpj.org/2015/04/10-most-censored-countries/>



more efficient way than the use of surveys and paperpack. However, there are significant challenges associated with relying on Big Data for educational policy making and implementation. The risk of low quality, biased and erroneous data could result in gravely harmful policy decisions. To this effect, I propose the following policy recommendations for the Ethiopian government for the use of Big Data in advancing the educational sector for its citizens.

### **6.1.Recommendation 1- Digital Literacy and STEM Education should be Prioritized**

Developing high skilled man power that will help collect, store and analyze data is very important. Especially in developing countries like Ethiopia where data can be manipulated due to low capabilities in verifying, human resource development is fundamental. There are positive initiatives by Ethiopian government in increasing government expenditure in research in science and technology, and making STEM the priority area in the educational policy. However, the quality of education should be the main concern as inferred from the latest NRI ranking. Unless educators at higher education institutions are well equipped in data analytics, low quality of skilled man power will not address the potential deficiencies of using Big Data as a policy tool. By making the use of technology an integral part of higher education learning, national education strategies can be targeted and incentivised based on analytics.

As a long term strategy, human development should focus on making digital literacy part of early stage of education at primary and secondary education. The current educational curricula does not provide for ICT enabled education at primary and secondary education. This impacts not only the culture of using technology as platform to express opinions in public issues but also hampers the creativity and innovation potential of Ethiopian students. Hence, the Ethiopian government should prioritize digital literacy not only at higher education but also at the lower education levels.

### **6.2.Recommendation 2- Digital Infrastructure needs to be Developed**

As a least developed country, Ethiopia's struggle to ensure the necessary infrastructure in terms of internet usage and mobile accessibility is self evident. However, the increase in the number of mobile device users makes it easier for the citizens to send and receive data. But this would be very unlikely with current internet penetration level. Even higher education institutions in the country either do not have broadband connection or have limited accessibility for students and educators. The use of Big Data in educational sector will not be possible unless the educators and students are given the platform to exchange ideas and facilitate research and innovation. The latest Internet Affordability Index put Ethiopia among the countries where internet is less affordable. Even out of developing countries, Ethiopia is one of the countries with low affordable internet usage, only ranking above Haiti, Democratic Republic Congo and Yemen.<sup>32</sup> To enhance ICT infrastructure and increase accessibility, the Ethiopian government should encourage investment in the sector. This can be achieved through allowing private and foreign companies to participate in telecommunications service provision, which is currently under the State monopoly. Especially taking into account the expensive nature of Big Data, liberalising the telecommunication market should be a priority.

### **6.3.Recommendation 3- Digital Privacy should be guaranteed and Open Government has to be adopted**

Big data can only be used as a tool for policy making and implementation if the government is responsive to the preferences and opinion of the citizens. Citizens will mainly trust the sources of Big Data or sending and receiving information if they trust the safety and security of the data they exchange. The behavior of the government towards the internet usage of citizens is important. As much as Big Data can be used for understanding and perfecting the public policy choice of the citizens,

<sup>32</sup> Alliance for Affordable Internet, Affordability Report 2021: A NEW STRATEGY FOR UNIVERSAL ACCESS,

available at [https://a4ai.org/wp-content/uploads/2021/12/A4AI\\_2021\\_AR\\_AW.pdf](https://a4ai.org/wp-content/uploads/2021/12/A4AI_2021_AR_AW.pdf)

it can be used for suppressing ideas that the government is not comfortable with. As mentioned before, Ethiopia is one of the most censored countries and even if accessibility has become easier, the usage would be stifled by fear of retaliation from the government. Without an open conversation about the problems in the educational sector, it is impossible to use Big Data to solve educational problems. Freedom to entertain ideas should be the basic feature of education and the government of Ethiopia should not underestimate the importance of that. For a government that tracks the social media posts, blogs and emails to suppress dissenting ideas, Big Data poses a serious threat to governance. To this effect, citizens need to be guaranteed digital privacy and data protection. A legal and institutional independence that protects the right to privacy of the citizens need to be adopted. Especially the lack of comprehensive data protection law in Ethiopia will hamper citizens from entertaining diverse ideas and exchange data on education and other policy measures. Hence, the Ethiopian government should adopt a data protection regime that encourages citizens to receive and impart opinions on important public policy issues including the education sector.

#### **6.4. Recommendation 4- Regulatory Changes are necessary to enhance the role of ICT in education**

Entry barriers in the ICT sector in Ethiopia need to be changed as barriers stifle innovation and limit access to internet. The ICT sector can only enhance innovation and efficiency if regulations that monopolize the telecommunication sector and discourage private sector investment are lifted. The role of the government should be limited to protecting the users and ensuring the fairness of the business methods of the digital era. Particularly in the education sector, research and innovation requires the freedom to navigate, exchange and analyze data without significant constraints. Unless the private sector investment and digital education institutions are liberalized, the regulatory constraints will hamper educational sector development. Big Data is an opportunity for harnessing well informed and competitive students

that could transform the way traditional public policy inputs are collected and analyzed. This requires both educators and students to have both access and freedom to exchange data.

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