THE ROLE OF ICT EDUCATION IN HARNESSING HUMAN CAPITAL DEVELOPMENT IN AFRICA

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ABSTRACT: *This study examined the role of ICT Education in Harnessing Human Capital Development (HCD) in Africa. It considered the vital component of ICT as it relates to Education in a vision towards an intelligent knowledge based society. ICT as an engine for promoting HCD, financial stability, enhancing wealth creation, job opportunities, and management of epidemic diseases such as Corona virus (Covid-19), Malaria, Hepatitis B, HIV/AIDS, Ebola Virus. Developed ICT policies and strategies are driven skills that harness productivity as well as impact the development of an informed society. However, inadequate knowledge, failure to implements policies, corruption, in-adequate man power work-force in education, are some of the critical challenges that have placed Africa far below average in rating. And proposed a model on the role of ICT education as way forward for harnessing HCD in Africa. The result showed that improvements on ICT Education and HCD significantly enhance Africa's potentials in Science, Technology, and Humanities for Sustainable Development.*

KEYWORDS*: Africa, Development, Education, HCD and ICT*

1. INTRODUCTION

Information and communication technology (ICT) has attracted the attention of researchers globally due to its social and economic benefits. With rapid increase in technological trend, ICT has become a road map for sustainable economic development in Africa. Hence, ICT education is fundamental in the emerging global technology of information oriented society. When people are deprived of what improves their capabilities, they are deprived of welfare, which may result to poverty, inequality and unemployment [SWA18]. Similarly, national growth and development can never be achieved in a bias Society [5]. However, education should be more accessible to people as an avenue that supports inclusive growth and HCD. Literatures such as [2][3][4][6][7][9][10][11] have proven that human capital development is a relevant component for developing the economy of any nation, since it improves the level of human capacity, particularly through education. The authors also suggested that HCD is an effective ICT program in Africa. More-so, inadequate technical knowledge on ICT and how to strategize for HCD in Africa is an important problem of interest, since ICT education may subsequently result to sustainable economic development. However, some African countries may not be able to buy the Idea of ICT strategies in advancing human capacity at the moment due to limited resources, abject poverty and many more. While other developing African countries suffer from inadequate knowledge, failed government policies, corruption, lack of empowerment, unemployment, poor industrialization, and so on. Hence, these challenges have subjected African countries far below average global age of 71 years from 2010-2013 [6][13].Therefore, African countries need to be fully informed so that they can participate in buying into these numerous ideas of technology in the digital era.

The rest of the paper is arranged as follows: section 2 describes some challenges of ICT and HCD. Section 3 expounds the methodology, Section 4, result and discussion, Section 5 concludes the paper.

2. CHALLENGES OF ICT AND HCD

Some challenges of ICT and HCD are as follows:

i. Inadequate knowledge: This is one of major challenge in Africa, due to either little or no parental support/government inability to educate citizens; which is tagged as African's greatest disease in advancing the course of HCD [ES14]. Education plays a vital role in both individual and nation building; sustainable development can be easily achieved if quality of education is guaranteed.

ii. Government Policies: most developed African countries pay less attention to policies

implementation that will have direct impact on their citizens; while spending the Government fund on less important projects, have left their citizens with no strategies that may have direct impact on HCD.

iii. Corruption: majority of the resources that would have been used for HCD has been side lined into personal use and these epidemics have done so much harm to most Africans countries.

Thus, the advancement of ICT has somewhat paved out an alternative path to development; but the urgency and enthusiasm with which this vital medium for social and economic change is embraced as a mirage. Effective use of ICT can bridge the gaps in Africa's low level of development, by means of knowledge transfer as well as addressing information problems so that the farmers, the industrialists and the entrepreneurs, have access to all the needed knowledge and skills.

ICT is a pathway to transforming traditional economy into information and knowledge-based economy. In the vision towards an "Intelligent society", Africa needs to be well informed. ICT Education therefore, can address issues of wealth creation, management of epidemic diseases such as Corona virus (Covid-19), Malaria, Hepatitis B, HIV/AIDs, and Ebola Virus respectively.

Hence, Several African countries needs to develop a comprehensive national policies and implementation strategies to transform their nations into information and knowledge based societies. Thus, the expansion of HCD especially through ICT is essentially imperative to Africa's social and economic development.

3. METHODOLOGY

This research investigates the role of ICT in harnessing HCD and employed the novel regression analysis with varying parameters testing; and finaly propose a model while exploring the systemic various component of the ICT as it relates their relevance to HCD in African.

3.1 Data Collection

The data on ICT and HCD for these Countries were sourced from the World Bank data catalog and the organization for economic co-operation and development (OECD), the UN, the ITU data, and the hardware, software and internal expenditure source and the existing literatures respectively. The set period for the data is haphazard since most of the data information where gotten from those research works due to financial constrained.
We hope to be able to go round the individual countries with the aid of funding from the required institutions in the future work.

Table 1: Illustrates countries with variant income level

High Income Countries	Middle Income Countries	Low Income Countries
Nigeria	Cape Verde	Zambia
South Africa	Cameroon	Madagascar
Egypt	Republic of Kongo	Sierra Leone
Algeria	Cote d'voire	Liberia
Angola	Djibouti	Niger
Morocco	Ghana	Guinea Bissau
Libya	Lesotho	Burundi
Sudan	Mauritania	Tanzania
Kenya	Saotome and Principe	Somalia
Ethiopia	Swaziland	Malawi
Ithopia	Angola	Namibia

3.2 Component of ICT

The components of ICT education that play vital roles in HCD are discuss in this section. These components includes namely: Mobile Stations and other telecommunication devices (MS), Hardware and Software. The increase in the number of wireless multimedia applications and multiple connections (Networks) within African continent with the use of MS is an ample opportunity for the African countries to further expand investment on ICT in other to harness HCD in Africa.

MS are one of the emerging technologies that yields millions in developing as well as developed countries like the United Kindom (UK), United States of America (US), China, Russia and the likes. one of which African countries can essentially explore to further harness HCD and the economy of the African Continent at large.

Hardware devices are the physical component of a computer system that can be seen and touch, while the software is the applications that enable an interaction with the hardware (user interface) which can be seen but cannot be touched unlike the hardware. The interaction effect was introduced into the model because the deployment of each component of ICT needs to be accompanied by harmonizing it with investments in order for the total ICT investments to impact on development by using four facets of ICT illustrated (Table 2), and by considering their individual importance as well.

3.3 Propose Model

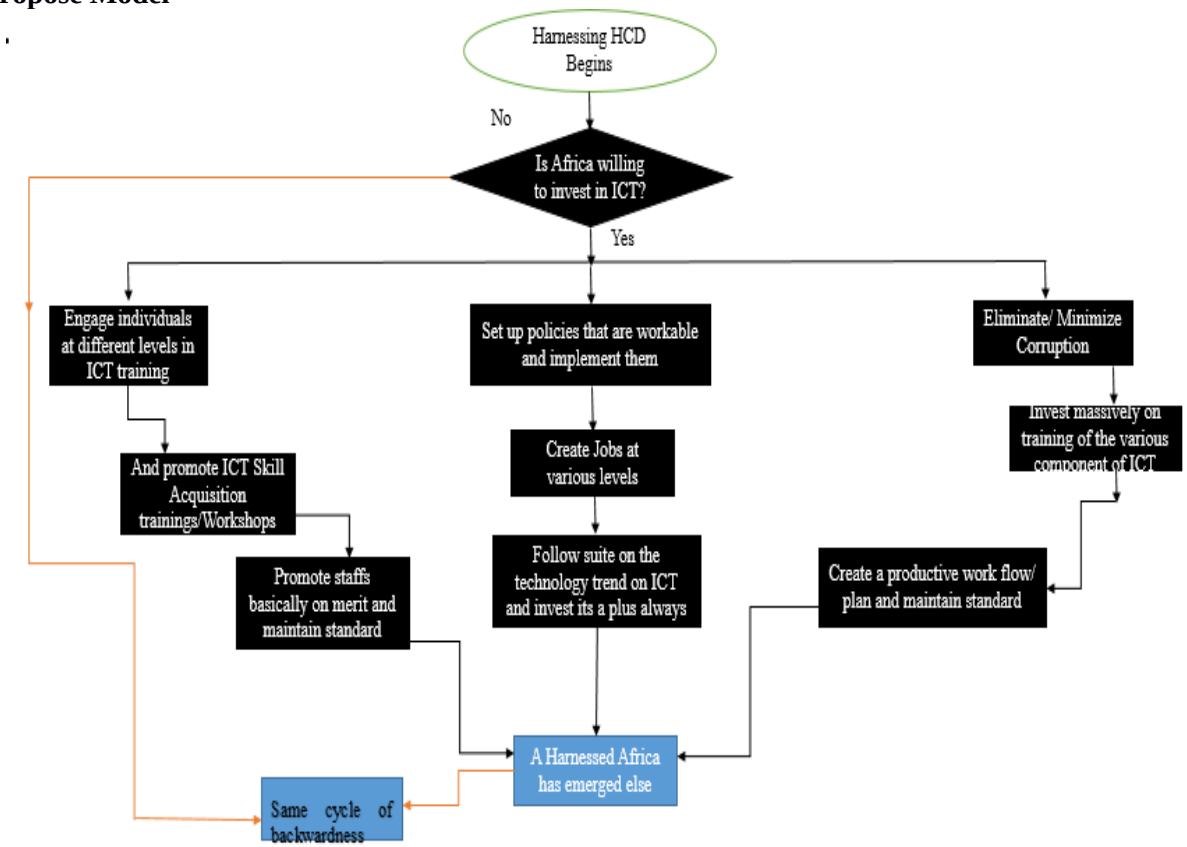

Figure 1: Decision making for aspiring African countries on ICT and HCD.

3.4 Analysis of Components

Table 2: Results of a Regression Analysis

Variables	Human Development	ICT Education	ICT in Health
MS and others	HI: 0.29*** MI: 0.084*** LI: 0.2007***	HI: 4.422*** MI: 4.127*** LI: 6:502***	HI: 0.031* MI: -0.142 LI: 0:385*
Software	HI: -0.000 MI: 0.000 LI:0.000**3****	HI: -0.000 MI: -0.00**4** LI:0.0**166****	HI: 0.000 MI: 0.000 LI:-0.00**3****
Hardware	HI: 0.000 MI: 0.000 LI: -0.000	HI: -0.0002** MI: 0.00**4***** LI:-0.004	HI: 0.000 MI: -0.002 LI:-0.005
Internal Expenditure	HI: 0.000 MI: 0.000 LI:-0.000	HI: -0.000 MI: -0.000 LI: 0.000	HI: -0.000 MI: 0.000 LI:-0.000
MSs *Internal Expenditure	HI: -0.0**27** MI: 0.017 LI:-0.063	HI: -1.306 MI: -1.443 LI:-4.239	HI: 0.**725** MI: 0.014 LI:-0.430
Software*Internal Expenditure	HI: -0.000 MI: 0.032 LI:-0.042	HI: **4.78*** MI: **6.117*** LI:-6.313***	HI: -0.056 MI: -1.445 LI:-1.648
Software*Hardware	HI: 0.0**33***** MI: 0.032 LI:-0.053	HI: -0.328 MI: -0.81 LI:**2.493****	HI: 0.**725**** MI: **2.15*** LI: **1.220****
Hardware*Internal Expenditure	HI: -0.076 MI: -0.114 LI:-0.**064****	HI: -3.18 MI: -6.415 LI:**6.43*****	HI: -1.422 MI: -0.371 LI:- -0.336
Note that	**HI =HIGH INCOME P < 0.11**	**MI = MID INCOME P < 0.56**	**LI = LOW INCOME P < 0.12**

A regression analysis of the various components of ICT is presented (Table 2). The study showed from T that MS and other telecommunication investments have a significant impact on HCD. While Telecommunications is vital in ICT infrastructure such as the internet. Thus, the need for investing in ICT Education from all countries within Africa which may further harness HCD. Improvements on HCD can be obtained by complementing telecommunication and MS investments in areas such as health and education. In addition, MS, telecommunication and internal spending have a positive impact in developing countries in Africa, while their impacts in mid income and low income countries within Africa are showing the gap of internal MS and telecommunication investments compared with the higher income countries.

The relationship is also true when it comes to ICT investment in both software and hardware as related to higher income countries and mid as well as low income countries. The fact that the regression analysis shows that software and hardware as well as ICT investment have a positive impact on human development in low income countries. Yet there are African countries that suffer from inadequate investments in ICT and HCD.

Thus, Africa needs to be harnessed and complemented with appropriate investments in hardware, software and internal expenses. It is also important to note that although internal expenditure does not show a direct statistically significant impact on the other variables of this research, its positive impact on human development is key parameters which are visible through its interaction with individual components of ICTs such as MS, telecommunications, hardware and software.

4. DISCUSSION

Table 2 illustrates that increased in ICT investment has a statistically significant impact on education for all African countries. The study also proved that, there is a significant impact in high income countries, due to the improved index of education used in this propose study. The index gives emphasis to higher education, the high income African countries considered in this study account for most of the developed as well as developing countries. These results also indicate that any empirical investigation with regards to high income countries and the levels of education needs to consider education as one of the vital parameters.

In mid income countries. Similarly, investments in hardware, MS and other telecommunication proved a significant impacts on education, as the interaction effect of software investment and internal expenditure.

In low income countries, the importance of ICT investment is proven to be imperatively actual. Hence, ICT investment have demonstrated a significant impact on education, as well as software investments respectively. Therefore, the investment in infrastructure must be balanced by investments in human resources for ICT investments to have an impact on education.

Results on the relationship between ICT investments and human development in area of health life expectancy (Table 2), showed MS and other telecommunication investment has a statistically significant influence on health and HCD. The massive use of ICT hardware, software as well as MS and telecommunication equipment in health care enables the health care staff to effectively and efficiently manage the health care sector, in all stages of operations from preoperative care to postoperative care.

With the recent global outbreak of now well-known corona virus (Covid-19) pandemic; numerous researches is ongoing with the aid of ICT. In this context the recent notion of e-health has become an integral part of today's new economy due to the important key roles being explored using ICT. It is not surprising that the life expectancies in high income countries are fairly high (89% average health index in 2005 and 2010) as measured by the HDI, in part due to the new technology, treatment of diseases as Malaria, Covid-19, Ebola, HIV and AID, Hepatitis **B** and **C** is gradually becoming easier to handle with the advent of ICT facilities. It is also important to note that the internal expenditure in MS and other telecommunications features prominently as a significant impact on health in high income countries. As noted in [13] the internal spending is directly related to human resource development and therefore to the health of a population.

In mid income countries however, the impact of ICT on health is rather mixed. While MS and other telecommunication as a whole does not have a significant impact on health in these countries, ICT however plays a significant role in health through a combined impact of software and hardware. Another reason for an insignificant impact of telecommunication investment on health within the African countries is rooted in the diversity of the African countries in this group in terms of levels of ICT development.

In low income countries it can be seen (Table 2) that, telecommunication investment has statistically significant impacts on improving health care. Moreso, the significant impact of software

investment and the interaction of hardware and software investments highlight the need for appropriate investments in these areas for health services in low income countries within the African continent.

CONCLUSION

This study presented the role ICT education in harnessing HCD, and proposed a model on how to effectively enhance HCD, in addition, the study examined a regression analysis testing on the vital strategic components of ICT that enhances efficient HCD, and investigates the impact as well as the role of ICT education in harnessing HCD.

Finally, the proposed study presents a way forward on how to improve ICT education in HCD within the African continent; and the study may be extended by analyzing the effect of ICT and HCD in Nigerian, with a focus on the education sector in Nigeria.

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