Assessment of Information Communication Technologies and Poverty Reduction in West Africa

Chukwuemeka Ifegwu Eke[1], Moan Ahenjir[2] & Ahmad Baba El-Yaqub[3]
[1]&[3]Department of Economics, University of Abuja, Nigeria
[2]Central Bank of Nigeria
Corresponding Email: yelwamhmmd@gmail.com

Abstract

The Millennium Declaration set 2015 as the target date for having the number of people living in extreme poverty. Exceptional progress in some developing countries makes achieving that goal globally a realistic possibility. However, many countries will fall for short, and up to 1 billion people are likely to remain destitute by the target date. What role is Information Communication Technologies (ICT) playing in this regard? This paper seeks to answer this question by look for shared characteristics of sixteen developing countries in the West African axis. These countries were compared using indicators of their macroeconomics characteristics and especially, their ICT economic characteristics. The countries chosen for analysis constitute a highly diverse mix. The group includes some poor and some rich in the region. From assessment, they differ greatly in their systems of governance and economic management. Yet, they posted some sterling statistics, not only in reducing poverty, but across the broad range of macroeconomic and ICT economic performance measures used to compare them. Research discoveries from time-series, cross-section regression analysis reveal that while economic growth generally was an important contributor to poverty reduction, the ICT sector mattered substantially, with growth in ICT-oriented, ICT-intensive and ICT-Allied enterprise incomes being especially important.
Keywords: Poverty Reduction, ICT for Development, Cybernomics, ICT-Adoption

1.   Introduction

Muhammad Yanus, founder of Grameen Bank and 2006 Nobel laureate observed that: *"Entrepreneurship, if properly harnessed and empowered can lift millions of people of poverty ".* In the last decade we now find that people in developing countries especially West Africa who depend on Information Communication Technologies for their living and they represent a significant share. Achieving the Millennium Development Goals (MDGs) of

having poverty by 2015 simply implies finding ways to generating the incomes and expanding the income base and threshold of poor people. In what concrete ways can governments in the vast West African sub region spurt is kind income growth? Specifically, how can they improve network co-operation, Information Communication Technologies (ICT) trade-ables and ICT cross border policy to better promote ICT's contribution to poverty reduction? This paper seeks answers to that question.

Globally, the World Bank reports that the percentage rate of poverty has declined steadily during the past thirty years, an achievement credited largely to economic growth (World Bank, 2012). What triggered this economic growth and, more relevant for present purposes, what was ICT's contribution to this growth? There is widespread agreement on basic preconditions, such as:

Smooth access to telecommunication network and stable network, solid ICT infrastructure; non-discriminatory tax and robust ICT policy; high rates of investment in ICT research and upgrade; employment creating ICT growth; well-functioning institutions; corporate governance and so on. However, debate abounds on their relative importance and what government ought to do to promote them. We decided to approach the debate by assessing shared characteristics of West African countries posting exceptional success in reducing extreme poverty over the past decade. Inspired by the World Ban's 2012 Growth Report, our method is based on the premise that the pre-conditions are similar and everywhere across the sixteen West African countries.

We started by looking at some indicators of economy-wide economic performance but then gave particular emphasis to common features of the cyber economies of the selected countries. We decided not to establish causality or to quantify the relationships between the various indicators and poverty. We aimed simply to see if these West African countries were similar in other socioeconomic respects. The insights obtained from this multi-country overview are meant to inform the design of in-depth case studies of ICT's contribution to poverty reduction in Africa as a whole wherein we may seek to quantify poverty impacts through econometric or simulation analysis. It is hoped that findings from the case studies will eventually provide the basis for development of policy principles and recommendations to foster progress in reducing poverty using ICT-oriented matrix.

2.   Literature Review

Historically, few issues have attracted the attention of economists as has the role of ICT in economic development and poverty reduction,

generating an enormous literature of both theoretical and empirical studies. Much of this literature focuses on the process of institutional transformation of cybernomics and economies, be it the least developed ones where economic activity is based largely on agriculture, to high-income countries where industry and services sectors dominate. ICT based economics activities finds its relevance in all case studies.

An increasing reliance on ICT in all works of life share in GDP is an inevitable consequence of cyber-economic progress (Fellegi, 1998; Barlow, 2003). This is also attributable to higher income elasticities of demand for ICT- oriented and ICT-based economic goods and services. As their incomes grow, consumers increase their preference and consumption of manufactured goods, services and even food faster through channels such as online bookings, online payment and deliveries. Paradoxically, the process is usually accompanied by rising incomes and a lower incidence of poverty among those who depend on enterprises hinged on ICT deliverables for a living.

Lewis (1955) was one of the first of many development economists attempting to explain the paradox. He viewed economic development as a process of relocating factors of production from a sector characterized by low productivity to another sector that attracts higher productivity and bottom-line. Lewis' theory was exploited and interpreted as pro-industrialization and used to justify heavy taxes on agricultural sector (Kirkpatrick & Barrientos, 2004). Four years Anderson and Valenzuela (2008) observed that the theory has been largely debunked by later work and the degree to which economic policies of developing countries discriminate against agriculture has lessened dramatically in recent decades.

ITU (2004) emphasizes the historically close correlation between different rates of poverty reduction over the past 20 years and differences in ICT related performance particularly the rate of growth of economic productivity. The authors see links between ICT and poverty reduction as being forged through five transmission mechanisms: cheaper and democratized access to the internet; direct impact of ICT adoption and improved performance on rural incomes; impact of cheaper goods and services for both urban and rural poor; ICT's contribution to growth and the generation of economic opportunity in across all economic sectors; and ICT's fundamental role in stimulating and sustaining economic transition, as countries (and poor people's livelihoods). They go on to note that the potential for future poverty reduction through these transmission mechanisms depends on the extent to which economic productivity (via ICT) can be increased where it is most needed.

Many recent studies focus specifically on quantifying the relationship

between ICT/Cybernomics and poverty. Duncombe (2006) frame his analysis in terms of three key channels they say links ICT enhanced growth to poverty: labour market, ICT enterprise income, and broad based internet access. They provide a theoretical framework for investigating the quantitative importance of those various channels and then report findings from six country case studies. They conclude that when both the direct and indirect effects of ICT spurred growth are taken into account, such growth is more poverty reducing than growth in pre-ICT adoption times. ITU (2011) emphasize especially that ICT's contribution to poverty reduction is consistently greater than is ICT's share of GDP. For the case study countries, ICT's contribution came mainly through the labour market channel. The report caution however those growth strategies based on such findings may not be valid in circumstances where ICT output mix does not feature labour market activity. Equally problematic for such a strategy is that much progress in ICT adoption historically has come from the introduction of labour saving technologies.

Bloom et al (2010) combine time series and cross-section data to estimate regression coefficients connecting consumer expenditures by decile to ICT/GDP. Their findings are consistent with claims that ICT sector growth is substantially more important than ICT-Adoption sector growth for those in the lower deciles of the expenditure distribution, i.e., the poorer segments of the population. They find the opposite result for richer ones, i.e. that the expenditure elasticity ICT-Adoption growth is much higher than for ICT growth leading them to conclude that their findings are consistent with claims that ICT/ICT-Adoption sector growth is pro-poor.

It is Christiansen and Demery (2007) argument that the contribution of economic growth to poverty reduction might differ across sectors because the benefits of growth might be easier for poor people to obtain if economic growth is concentrated within sectors where they are active. This reasoning implicitly assumes that transferring income assets in one economic sector to another sector is possible because of the political economy of Cybernomics. They too find that growth originating in ICT adoption is on average significantly more poverty reducing. Similarly, Garcia et al (2013) find that the ICT- Adoption in China's primary sector that was the real driving force in her spectacular success against absolute poverty. They conclude that the idea of a trade-off between China's sectors in terms of overall progress against poverty in is negligible given how little evidence they found. While most empirical studies show that ICT- Adoption growth is relatively more important than ICT sectors, underscoring the existence of potentially important differences in the sectoral GDP elasticities of poverty across countries, depending on their rates of ICT diffusion (Adera et al, 2014).

The book also postulated that a common finding within the: eastern and southern African axis, is that the poverty reducing powers of ICT declines as these countries get richer. The authors argued that, for example, that gains in income from ICT- Adoption sources were the main reason rural poverty declined in the case studies. On the other hand, Maynard (2007), based on pooled data for Indonesia, Thailand, Malaysia and the Philippines showed the services sector as having the greatest adoption of ICT and reduction on poverty. Time-series analysis for Taiwan reported in Chica et al (2012) found ICT cum industrial growth to be most poverty reducing. Similarly, Murshed (2007) found that the elasticity of rural headcount poverty with respect to ICT-Adoption growth in India is less than half that for ICT sector growth. They speculate that the latter occurs because of rapid growth in the adoption of ICT in the informal sector of the Indian economy. Interestingly, using a similar method of analysis for Ghana Kwapong (2007) estimate that ICT- Adoption growth had four times greater impact on poverty reduction.

Previous research suggests that ICT income growth is more effective in reducing poverty than ICT-Adoption growth in other sectors because: the incidence of poverty tends to be higher in informal sector populations than elsewhere, and most of the poor engage in informal sector enterprises and a large share of them depend on small and medium scale enterprises for a living (World Bank, 2012; Eke & Aluko, 2006; Eke, 2010) We introduce another complication by acknowledging that perhaps growth in per capita income economy-wide is itself driven by growth in informal sector income, i.e. that SMEs are the engine of economy-wide performance (Bleischwitz et al, 2010). This work reviewed past attempts by researchers to draw causal connections between economy-wide growth and growth in one or another economic sector. They concluded that a common set of factors are simultaneously driving growth in all sectors. ICT/ICT-Adoption sector growth will be a more important driver of overall growth in countries where its sector share is large. Of course, the claim that in this information age, ICT/Cybernomics is the engine of economic growth is not based solely on the growth accounting arithmetic. Many people believe there is more to the story because ICT-Adoption sector growth exhibits a higher multiplier than ICT sector growth (Kramer et al, 2007).

West African countries have achieved rapid poverty reduction; however, it is common notion that a nation's economic growth is not absolutely essential to progress in reducing poverty. According to (Eke, 1997) poverty refers to how much money poor people spend on goods and services. Incomes from work are of course the most important source of spending money for most poor people but some get money from other sources. For

example, in Ravallion (2009) the report shows that sustainable poverty reduction is theoretically possible through financial transfers from higher to lower income people in all but the poorest of developing countries. Acosta, Fajnzyiber and Lopez (2007) posited that other sources effective in reducing poverty is remittances from people who work abroad.

2.1   Measuring Poverty and Success in Reducing it

Our method requires first choosing a list of variables within the West African countries that can be judged successful in contributing to reducing their national poverty rates. To proceed we therefore need both a definition of poverty and a way of assessing these countries according to their progress in reducing it. In tracking progress for the MDG's, poverty in the West African countries is measured by a standard representing the poverty lines found among the poorest countries of the world. The line is USD 1.25 a day in 2005 prices, which is the average of the poverty lines found in the poorest 15 countries in terms of per capita consumption (Chen & Ravallion, 2008).

2.2   Selection Process

We turn now to the specifics of the selection procedure and results obtained in applying it. There were four distinct steps. First, we identified a list of ICT applications/technologies that: (a) exhibited an initial USD 1.25 per day and a poverty rate of more than 10%; (b) posted reductions in that rate over the entire range of years for which poverty data are available, within the 2005-2012 range; and (c) had at least two years of poverty survey data to calculate trends.

In the second step we calculated the average annual reduction in the poverty rate posted by each of those West African countries over the entire range of years for which poverty estimates are available. The range of years covered by poverty surveys (from the initial to the most recently published survey) and the number of annual surveys conducted within that range of years varies greatly from one country to another.

Our third step in selection process was based on the observed pace of ICT inspired poverty reduction. In this step we chose only those technologies that coincidence the annual average decline in the poverty rate from the year of the first to the year of the last observation (survey) would permit a halving of their respective initial poverty rate in 10 years or less. Finally, Table 1 shows the sixteen countries in West Africa. The next column contains the estimated annual average reduction in the poverty rate for the years of data availability. The base year is 2005and all countries in the list reduced their poverty rates in the years between their respective first and last survey year

and others are on pace to achieve similar reductions in the next few years, e.g. Mali, recorded a reduction to the tune of 2.93%, Mauritania, 1.68%; and Ghana, 2.71%.

Table 1: Poverty Outcomes in West Africa

S/No	Country	Average Annual Reductions
1	Nigeria	-3.43
2	Ghana	-2.71
3	Ivory Coast	-0.98
4	Burkina Fasso	-1.85
5	Mali	-2.93
6	Guinea	-0.79
7	Senegal	-0.82
8	Niger	-2.64
9	Benin	-1.54
10	Sierra Leone	-0.32
11	Togo	-1.65
12	Liberia	-1.55
13	Mauritania	-1.68
14	Guinea Bissau	-1.09
15	Gambia	-2.18
16	Cameroun	-1.34

Source: Calculations   based   on   data   from wivw.data.worldbank.org/topic/poverty

2.3 General Characteristics of the West African countries

Did these countries show any remarkable progress on their Human Development Index (HDI)? Table 2 contains estimates of a development indicator monitored by the United Nations Development Program called the Human Development Index (HDI). The HDI index is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, knowledge, and a decent standard of living. Health is measured by life expectancy at birth; knowledge is measured by a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio; and standard of living by GDP per capita (PPP USD). It is expressed as a value between 0 and 1. The closer a country" s index is to 1 the higher its rank on the HDI. We use the index here to corroborate, rather than to explain, the achievements made by our countries in reducing national poverty rates. Using the chosen range of years, Nigeria scored 0.867; while Cameroun had 0.689. All these countries made some effort at improving their respective HDIs.

Table 2: Percentage Changes in Human Development Index in West Africa, 2005 - 2012

S/No	Country	Percentage Change
1	Nigeria	0.867
2	Ghana	0.846
3	Ivory Coast	0.830
4	Burkina Fasso	0.829
5	Mali	0.812
6	Guinea	0.811
7	Senegal	0.781
8	Niger	0.779
9	Benin	0.757
10	Sierra Leone	0.771
11	Togo	0.766
12	Liberia	0.733
13	Mauritania	0.728
14	Guinea Bissau	0.710
15	Gambia	0.708
16	Cameroun	0.689

Source: Calculations based on data from www.data.worldbank.org/topic/poverty

We now turn to a comparison of the features of economy-wide economic performance of our sixteen countries that might help to explain their achievements in poverty reduction and the corroborating improvements in their Human Development scores. Table 3 contains a short list of macro-economic indicators that often feature in descriptions of a country's economic performance. The list begins with an estimate of the economy-wide growth in GDP/capita. Economic growth is viewed by many economists as the only sustainable cure for poverty. Unsurprisingly then, the majority of the countries in our list experienced positive per capita income growth during the years when their poverty rates were falling. West African countries posted reductions in poverty even though per capita incomes were falling. In some cases, e.g. Niger, this may be explained by differences in coverage of the poverty and income data. It could well be the case that achievements in poverty reduction occurred during sub-periods when per capital incomes were rising even if they fell when considering the entire range used in calculating income growth rates. Additionally, as already noted, economic growth is not strictly necessary for a country to achieve progress in reducing poverty.

Table 3: Percentage Change in macroeconomic indicators, 2005 -2012

S/No	Country	GDP per capita annual growth (%)	Trade Openness (%)	Composite Macroeconomic Stability Index (%)
1	Nigeria	0.867	1.23	8.83
2	Ghana	0.846	1.41	9.34
3	Ivory Coast	0.830	0.57	9.33
4	Burkina Fasso	0.829	0.62	8.59
5	Mali	0.812	0.20	7.84
6	Guinea	0.811	0.27	7.17
7	Senegal	0.781	0.3	7.36
8	Niger	0.779	0.10	8.00
9	Benin	0.757	0.83	7.45
10	Sierra Leone	0.771	0.23	8.54
11	Togo	0.766	-1.44	8.23
12	Liberia	0.733	0.55	8.49
13	Mauritania	0.728	0.42	6.70
14	Guinea Bissau	0.710	-0.7	5.78
15	Gambia	0.708	0.78	7.54
16	Cameroun	0.689	0.31	8.12

Source: WDI, 2013; PRS-Group, 2013; Calculations based on data from www.data.worldbank.org/topic/poverty

The middle columns of Table 3 compare for each of the selected countries the evolution from 2005 to 2012 of an index of trade openness - the sum of exports and imports expressed as a percentage of national GDP. The higher the value of this percentage, the less restrictive trade policy is seen to be. Interpreted in this way, almost all West African countries (except Togo and Guinea Bissau) improved their performance (became more trade friendly) during the period when their poverty scores were also improving. In the few cases where trade openness did not improve, the declines were relatively very small.

The final columns of Table 3 show the evolution of an indicator of macroeconomic performance based on data from the International Country Risk Guide (PRS-Group, 2012) and used as a barometer of overall economic health of a country. A country's score on this indicator is based on the average

of three measures: the budget balance score, inflation score, and exchange rate stability score. This index too indicates significant improvement in economic conditions in virtually every one of the countries from the 2005 - 2012. The overall picture that comes into to focus when looking at the figures in Table 3, corroborated by findings from other analyses, e.g. in the World Bank's development report on ICT (World Bank,2012), is that countries achieving success in reducing poverty did so while posting impressive progress in macroeconomic performance. The body of research findings on the subject points to the fact that successful macroeconomic performance is, if not strictly causal, a necessary pre-condition to success in combating poverty.

How important was ICT/ICT-Adoption growth?

Table 4 tabulates growth rates of ICT GDP/worker and non-ICT GDP/worker. The ICT GDP per worker series is, as the name implies, the ratio of total GDP for the sector divided by the estimated number of economically active workers claiming ICT as their main source of income. Non-agricultural GDP per worker was defined residually, i.e. as the difference between total national and ICT GDP divided by the difference between total national and ICT employment. ICT GDP comprises the returns to ICT hardware, Software, and skills used in ICT. It constitutes a good indicator of ICT income trends assuming Cybernomics agents own most of the resources and supply most of the skills used in the sector. There are some troubling facts about ICT employment surveys. This is so because of a high incidence of part time Cybernomics agents in the market, the number of workers in ICT may be overestimated and thus estimates of ICT GDP per worker in ICT underestimated. This also leads, in turn, to estimates of average skill productivity (GDP/worker) that are biased downward for ICT and upward for non-ICT.

Table 4. Key Indicators, 2005-2012

S/No	Country	Annual Growth in ICTGDP/ Wk (%)	Annual Growth in non- ICTGD P/Wk (%)	Composite Macroeconomic Stability Index (%)
1	Nigeria	0.867	1.23	8.83
2	Ghana	0.846	1.41	9.34
3	Ivory Coast	0.830	0.57	9.33
4	Burkina Fasso	0.829	0.62	8.59

5	Mali	0.812	0.20	7.84
6	Guinea	0.811	0.27	7.17
7	Senegal	0.781	0.3	7.36
8	Niger	0.779	0.10	8.00
9	Benin	0.757	0.83	7.45
10	Sierra Leone	0.771	0.23	8.54
11	Togo	0.766	-1.44	8.23
12	Liberia	0.733	0.55	8.49
13	Mauritania	0.728	0.42	6.70
14	Guinea Bissau	0.710	-0.7	5.78
15	Gambia	0.708	0.78	7.54
16	Cameroun	0.689	0.31	8.12

Notes: Growth rates calculated as the annual average difference in the logarithms of indicators.
Source: Calculations based on data from www.data.worldbank.org/topic/poverty Source: WDI, 2013; PRS-Group, 2013; ITU, 2012

The data in Table 4 reveal a widely varying pattern of per worker GDP growth rates among West African countries over the study years. Strikingly, ICT GDP per worker grew in all sixteen countries. On the other hand, average per worker GDP in non-ICT grew in only 14 of 16. This pattern is consistent with two characteristics typifying the normal development process. First, it is usual that as countries develop, per worker ICT GDP grows faster than per worker GDP in non-ICT sectors. Second, it is also common that in developing countries most literate poor people depend on ICT for a living. We estimated these relationships using multiple regression analysis employing a dataset that combined all of the cross-section and time-series data for all available years of poverty surveys. The estimating equation, estimated coefficients and their statistical properties are reproduced in the Annex. The regression equation explains a high percentage of variation in the time-series, cross-section poverty rate data. The regression. coefficients for ICT GDP/worker, non-ICT GDP/worker are all statistically significantly negative as suggested by theory. The estimated coefficient on ICT GDP/worker is significantly higher than that for either of the other two variables but this does not necessarily imply that growth in ICT GDP/worker was more important than growth in the other two variables since the answer to that question also depends on actual rates of growth in the three variables over the study period. Table 5 shows the

breakdown thus obtained, revealing that based on Voice call subscription, 8 out of the 16 countries growth in ICT GDP drove poverty down, followed by growth in data bundle subscription (5 out of 16) with only three countries shown to have reduced poverty mainly because of growth in cybercafe subscription.

Table 5: Major contributor to poverty reduction

S/N	Cyber Cafe Subscription	Data Bundle Subscription	Voice call Subscription
1	Mali	Mauritania	Ghana
2	Burkina Fasso	Nigeria	Senegal
3	Niger	Togo	Ivory Coast
4		Guinea	Liberia
5		Benin	Sierra loene
6			Guinea Bisau
7			Gambia
8	3	5	8

Source: Calculations   based   on   data   from www.data.worldbank.oru/topic/poverty; WDI, 2013; PRS-Group, 2013; ITU, 2012

Characteristics of countries where agriculture contributed positively to poverty reduction

The above analysis is fully consistent with most prior analyses in showing that ICT progress contributes strongly to poverty reduction. Now we want to see if there are common characteristics of these ICT-Adopting economies as ICT contributed positively to reducing poverty that might help us better understand what features of ICT performance government's might wish to emphasize in their development efforts. Table 4 shows that ICT GDP/worker grew, and thus contributed positively to poverty reduction, in sixteen countries.

4.   ICT Policy

A frequently cited essential ingredient in the recipe for ICT-Adoption success is access to World Wide Web unfettered by too much interference by governments (Kramer et al 2007/ So, how did ICT subscription changeover the study period? The data in Table 6 provide a partial answer to this question. The numbers in the table are estimates of the, an estimate of the average ICT subscription growth rate which also shows ICT diffusion rates and it contributed positively to poverty reduction. All the West African countries studied showed remarkable progress in ICT diffusion.

Table 6: Evolution of ICT Subscription in West Africa

S/No	Country	Average ICT Subscription Growth Rate 2003 -2005	Average ICT Subscription Growth Rate 2006- 2008	Average ICT Subscription Growth Rate 2009 - 2012
1	Nigeria	-22.41	-1.04	4.03.
2	Ghana	-5.84	-1.94	8.13
3	Ivory Coast	13.09	5.04	3.34
4	Burkina Fasso	-32.80	-5.83	8.02
5	Mali	13.72	-1.05	-5.50
6	Guinea	3.74	-7.58	12.00
7	Senegal	-1.66	1.03	1.20
8	Niger	-1.34	-1.59	0.12
9	Benin	3.40	17.42	11.32
10	Sierra Leone	-7.69	-4.22	12.11
11	Togo	-4.13	-2.04	-0.20
12	Liberia	8.83	25.68	21.97
13	Mauritania	-13.87	-12.39	19.42
14	Guinea Bissau	3.40	17.49	11.32
15	Gambia	-7.69	-4.22	12.11
16	Cameroun	-13.87	-12.39	19.42

Notes: ICT Subscription refers to average subscriptions in Voice calls. Cyber Cafe and Data Bundle
Source: Calculations based on data from www.data, worldbank.org/topic/poverty; WDI, 2013; PRS-Group, 2013; ITU, 2012

Subscriber Base

ICT progress, typically measured by growth in Subscriber base/Subscription, has been driven more by democratization of access brought about by technical advance and economic factors. Empirical analysis repeatedly confirms that the rates of return to investments in ICT development research is high (Eke, 2013). Subscriber base in all West African countries studied, have grown which itself spurred the growth in ICT diffusion. Cameroun grew from a negative of 13.87% (2003 - 2005) to 19.42% (2009-2012).

ICT Diffusion and Poverty in West Africa

The payoff from investments in ICT research, and development comes in the form of sustained increase in internet access and manpower

productivity. Comparisons of ICT diffusion/performance among countries and over time are frequently made using ICT diffusion indicators. We should expect therefore that West African countries where ICT contributed to extra ordinary progress in poverty reduction might also have posted strong productivity gains. Bleischwitz et al (2010) reports findings from a comprehensive study of ICT diffusion covering countries. In our case study, we have seen strong gains in ICT diffusion and productivity. Nigeria for instance, moved from a negative of 22.41% (2003 - 2005) to another negative of 1.04% and then to a positive of 4.03%. Benin Republic on the hand, responded quite fast to ICT. It recorded a positive 3.40% (2003 - 2005) to 17.42% (2006 - 2008) and slumped due to global financial/economic crisis to 11.32% (2009 - 2012).

5.   Conclusion

The countries in West Africa were successful in achieving poverty reduction. The region includes some of the poorest and some of the richest developing countries in the continent. These countries also differ greatly amongst themselves in their systems of governance and economic management. During the period under review, these countries posted impressive success in reducing poverty they were also experiencing substantially positive improvements on other economic performance indicators: by most measures the macroeconomic context became progressively more favourable; and their own governments were increasing incentives, by lowering import taxes, moderating exchange rates and by dismantling inefficient state interventions in ICT markets. The accumulated body of research on this issue is clear that successful ICT-oriented macroeconomic performance is, if not strictly causal, a" necessary pre-condition to success in combating poverty. At the same time, we found that while economic growth generally was an important contributor to poverty reduction, the sector mix of growth mattered substantially. Especially relevant to the objectives of the overall project of which this paper is part was the great importance of the ICT/Cybernomics sector growth for poverty reduction in a majority of the selected countries.

Looking at the question in that way permitted us to make a preliminary partition of the importance of growth in ICT GDP/worker relative to that of growth in non-ICT GDP/worker. That analysis attributes to per worker growth in ICT GDP the majority share of progress in reducing poverty in those countries posting the greatest progress in doing so.

During the study period investment in ICT in the selected countries were increasing generally and significantly faster than in some other African

region. Perhaps as a reflection of that extra investment, in all of the countries where ICT contributed to rapid progress in poverty reduction, skill productivity rose, and at rates generally higher than other countries in their respective regions and perhaps globally. Although the data are somewhat shaky, the share of the total investment spent on ICT is not extraordinarily high and has generally been declining.

Due caution is needed in interpreting these findings, and in particular it is premature to draw policy conclusions. The purpose of this paper was simply to obtain an overall picture of the economic characteristics of these West African countries achieving the fastest progress in using ICT to reduce poverty. It would be wrong to conclude that the more investment there is in ICT, the more growth will follow and the more poverty will be reduced. Careful attention needs to be paid to the specific situation in individual countries, to the nature of investments in the sector, and in particular to the macroeconomic environment in which the sector operates.

References

Acosta, P., Fajnzylber, P. & Lopez, H. (2007). The impact of remittances on poverty and human capital: Evidence from Latin American household surveys. *World Bank Policy Research Working Paper,* No. 4 247.

Ofwona, A. E., Waema, T. M. & Ophelia, J. M. Mascarenhas, & Diga, K. (2014). (eds) ICT pathways to poverty reduction: Empirical evidences from Eastern and Southern Africa. Canada: Practical Action Publishing.

Anderson, K. & Valenzuela, E. (2008). Estimates of global distortions to 1 agricultural incentives, 1955 to 2007, World Bank, Washington, DC, October 2008.

Bleischwitz, R., Welfens, P. J. J. & Zhang, Z. X. (2010). The international economics of resources and resource policy. *Int Econ Econ Policy,* 7,147-151.

Bloom, N. Mirko, D. Kretschmer, T. & Sadun, R. (2010) The economic impact of ICTSMART. centre for economic performance. London School of Economics.

Chen, S. & Ravallion, M. (2008). The developing World is poorer than we thought, but no less successful in the fight against poverty. August 1. *World Bank Policy Research Working Paper Series.*

Chica, R., Guevara, O. Lopez, D. & Osorio, D. (2012). Growth determinants in Latin America and East Asia: has globalization changed the engines of growth? Available online @ '

'http://www.fedesarrollo.org.co/wp- content/up loads/2012/09/Growth- determinants-in-Latin-America-and-East-Asia-Chica-Guevara-Lopez-Osorio-C.-E.- Junio-2012-pp.-161-203.pdf

Christiaensen, L. & Demery, L. (2007). Down to Earth Agriculture and Poverty Reduction in Africa, The World Bank Group.

DuncQmbe, R. (2006). Using the livelihoods framework to analyze ICT applications for poverty reduction through micro enterprise. 3(3), 81-100.

Telecommunication Union (2011). The role of ICT in advancing growth in least developed countries trends, challenges and opportunities. Available Online @ www.itu.int

Eke, C. I. (1997). An assessment of poverty in the Federal Capital Territory. An Unpublished Bachelor of Science project submitted to the department of Economics, university of Abuja.

Fellegi, S. (1998) Statiscal Services - Preparing for the future. Available online @ www.ssc.ca/SSC1998. Barlow, J (2003) Cybernomics: Towards a Theory of Information Economics. Available online @ hup://www.rnillenium-projeets.orK International Telecommunication Union

Garcia, M. Garcia-Murillo, J. A. Velez-Ospina, & Vargas-Leon, P. (2013). The techno-institutional leap and the formation of new firms. *Journal of Information Policy* 3, 501- 536

Kirkpatrick, C. & A. Barrientos (2004), The Lewis model after 50 years. Manchester School, 72(6), 679-690.

Krammer, J. W; Jenkins, B. & Katz, R. (2010). The role of information communication technology in expanding economic opportunity. Available Online @ http://www.hks.harvard.edu/m-rcbg/CSRI/publications/report_22 EO%2QI CT%20Final.pdf

Kwapong F. O. (2007). Problems of policy formulation and implementation: The case of ICT use in rural women's empowerment in Ghana. *International Journal of Education and Development using Information and Communication Technology* (IJEDICT), 3(2), 68-88.

Lewis, A. (1955). *The theory of economic growth.* R.D. Irwin. Homewood, Illinois, 1955.

Magaji, S. & Eke, C. I. (2013). Measuring the technical efficiency of wired & wireless technologies in Nigerian cyber cafes. *CBN Journal of Applied Statistics,* 4(1), 15-34.

Maynard, N. C. (2007) Technology adoption and the role of government:

examining the national information and communication technology policies in developing countries. A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Public Policy

Murshed, S. M. (2007). The conflict-growth nexus and poverty of nations. DESA Working Paper No. 43 ST/ESA/2007/DWP/43 June 2007

Ravallion, M. (2009). Do poorer countries have less capacity for redistribution? One- Pager #97, The International Policy Centre for Inclusive Growth (IPC-IG).