



RELATIONSHIP BETWEEN ICT EDUCATION AND KNOWLEDGE ECONOMY IN AFRICA

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Invited Paper

by

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Agenda



- Introduction
- Aim and Objectives
- Questions
 1. *ICTed and IDI in Africa – Related?*
 2. *IDI and KEI (KE) in Africa – Related?*
 3. *ICTed and KE in Africa – Related?*
- Methods
- Definitions
 - IDI | KE | KAM | KI | KEI.
- Answers (by Analysis)
- Discussions & Conclusion

ABSTRACT

- Advancement in the technology and techniques of effective transmission of information has engendered an improvement in the wellbeing of humans.
- The Internet, Computers and Telephony (both mobile and fixed) have been major drivers of this advancement.
- Can educating a Nation's populace adequately to become proficient and skillful in exploiting the ICTs enhance the economy's preparedness for Knowledge Economy?
- This paper proffers an answer by investigating the relationship between ***ICTed***, ***IDI***, ***KE*** and ***KEI*** of African Nations.
- ***KEI*** and ***IDI*** data from World Bank Institute & ***ITU***

INTRODUCTION



- The Industrial revolution quickly spread like wild fire across the world.
- The Information Revolution, an aftermath of the Industrial age came next.
- The Knowledge-based Economy (a.k.a Knowledge Economy) has emerged as a consequence
- Trend in pervasiveness of information (data) and consequently knowledge is currently receiving a tremendous boost by the emerging Internet of Things (IoT) paradigm.
- The global economy is currently in a state of transition towards the Knowledge Economy. Education is a known and generally

- Education is a catalyst of growth.
- Without adequate and relevant technical education, no Nation or Region can benefit from emerging Knowledge Economy.
- According to OECD, the Knowledge based Economy implies those economies, which are directly based on the:
 - *Production*,
 - *Distribution*, and
 - *Exploitation* of **knowledge** and **information**.

AIM

To determine the Relationship between
ICT Education (*ICTed*)
and
Knowledge Economy (*KE*)
in Africa.

OBJECTIVES

Providing logical answers to the following questions will culminate in achievement of the aim.

- Q1. Is there a correlation between ICT Education (**ICTed**) and ICT Development Index (**IDI**) in Africa?*
- Q2. Is there a correlation between **IDI** and Knowledge Economy Index (**KEI**) in Africa?*
- Q3. What is the relationship between **ICTed** and **KE** in Africa?*

METHODOLOGY



- ✓ Literature review and definition of terminologies:
 - ICT Education (vs. ICT in Education),
 - ICT Development Index (IDI),
 - Knowledge Assessment Methodology (KAM),
 - Knowledge Economy (KE),
 - KE Index (KEI).
- ✓ Establish correlation between **ICTed** and **IDI**
- ✓ Assume **KEI** based on WBI **KAM** as measure of **KE**.
- ✓ Establish correlation between **IDI** and **KEI**
- ✓ Infer correlation between **ICTed** and **KEI**
- ✓ Submit on the relationship between **ICTed** and **KE**
- ✓ Identify means of improving **ICTed** with a view to enhancing **KEI** for Africa.

Definitions



ICT Education vs. ICT *in* Education

- **ICT Education** can be defined as the study of tools and techniques for reliable information content transmission and reception over appropriate conduit.
- **ICT in Education** is the use of the ICTs in the realisation of pedagogical objectives.
 - *ICT in Education* not synonymous to ICT education and as such cannot be used interchangeably.
 - An understanding of this is necessary for the purposes of this study.

ICT Development Index (IDI)



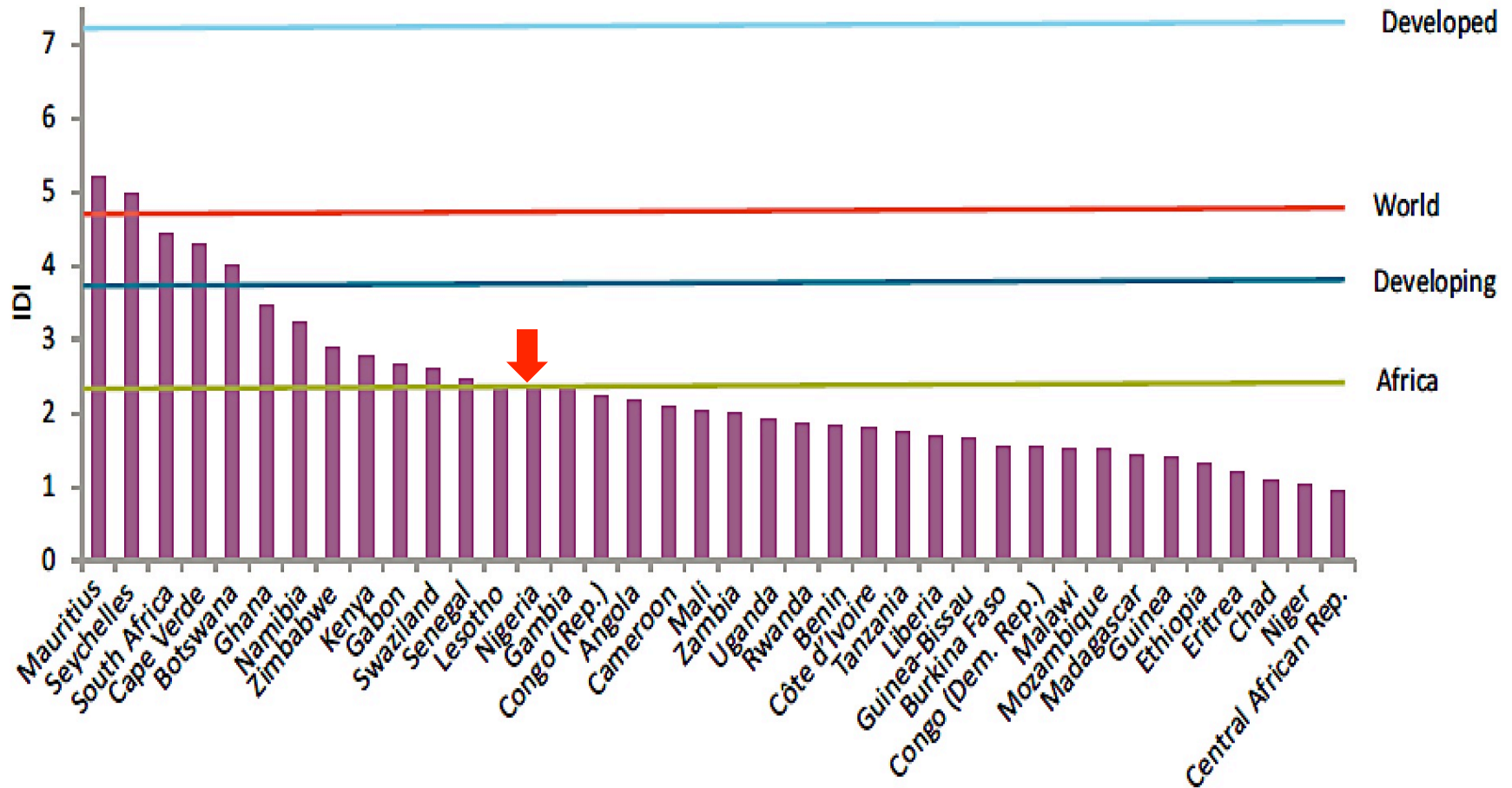
- Developed by ITU in 2008
- Made up of 11 separate indicators.
- Aims at benchmarking different measures for comparing ICT developments across countries and regions of the world.
- Main objectives are to measure [3]:
 - a) Level and Evolution of ICT developments;*
 - b) Progress in ICT development in both developed and developing countries;*
 - c) Differences between countries in terms of their levels of ICT development (aka Digital Divide);*
 - d) Extent to which countries use ICTs to enhance growth and development, **based on available capabilities and skills.***

Top Five Economies by Region and Their Respective 2013 Global IDI Rank



Africa	GIR	Europe	GIR	Asia & Pacific	GIR	Americas	GIR	Arab States	GIR	CIS	GIR
Mauritius	70	Denmark	1	Korea (Rep.)	2	USA	14	Bahrain	27	Belarus	38
Seychelles	75	Sweden	3	Hong Kong, China	9	Canada	23	UAE	32	Russia	42
RSA	90	Iceland	4	Japan	11	Barbados	35	Qatar	35	Kazakhstan	53
Cape Verde	93	UK	5	Australia	12	Uruguay	48	S. Arabia	47	Moldova	61
Botswana	104	Norway	6	Singapore	16	St. Kitts & Nevis	54	Oman	52	Azerbaijan	64

African 2013 IDI Values Compared with Developing/Developed-country Averages



Weights Used for Indicators and Sub-indices Included in the IDI



		Indicators	Sub-index
Skills	Adult literacy rate (A)	0.33	0.20
	Secondary gross enrolment ratio (S)	0.33	
	Tertiary gross enrolment ratio (T)	0.33	
Access	Fixed-telephone subscriptions per 100 inhabitants	0.20	0.40
	Mobile-cellular telephone subscriptions per 100 inhabitants	0.20	
	International Internet bandwidth per Internet user	0.20	
	Percentage of households with a computer	0.20	
	Percentage of households with Internet access	0.20	
Use	Percentage of individuals using the Internet	0.33	0.40
	Fixed (wired)-broadband subscriptions per 100 inhabitants	0.33	
	Active mobile-broadband subscriptions per 100 inhabitants	0.33	

Source: ITU.

Knowledge Economy (KE)



- Powell and Snellman of Stanford University defined Knowledge Economy as:
 - *“Production and services **based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence.”***
- In the Knowledge Economy, greater emphasis is placed on ***intellectual capacity and the proceeds thereof***, rather than on physical input and natural resources.

Knowledge Assessment Methodology (KAM)



- Designed by the Knowledge for Development (K4D) program as interactive benchmarking tool.
- To help countries determine necessary steps to take towards becoming knowledge-based economy compliant.
- Made up of **148 variables** used in determining countries' performance vis-à-vis the **4 KE pillars**.

Available online at: www.worldbank.org/kam.

Knowledge Index (KI)

- The KAM determines the Knowledge Index of a country/economy.
- It is essentially a measure of the economy's capacity to
 1. generate,
 2. adopt, and
 3. disseminate knowledge***for productive purposes*** that invariably affect its socio-economic growth

Knowledge Index

Pillar i:

Education Index:

1. Average years of school
2. Secondary Enrollment
3. Tertiary Enrollment

Pillar ii:

Innovation Index

4. Royalty payment & Receipts
5. Patent Count
6. Journal Articles

Pillar iii:

ICT Index

7. Internet users
8. Computers
9. Telephones

Knowledge Economy Index (KEI)



- The KAM Knowledge Economy Index (KEI) goes a step further than the KI by taking into account ***how conducive the environment in a country is to fostering the use of knowledge for economic development.***
- It represents the overall level of a country's development towards (or preparedness for) the Knowledge Economy.

Knowledge Economy Index

Knowledge Index

Pillar iv:
Economic &
Institutional **R**egime

- 10. Tariff & Nontariff Barriers
- 11. Regulatory Quality
- 12. Rule of Law

ANSWERS



a. On Correlation between *ICTed* and *IDI* in Africa

- *H01: There is no correlation between **ICTed** and **IDI** (for African Nations)*
- *Ha1: A relationship exists between **ICTed** and **IDI** (for African Nations)*

$$ICTed \equiv ICT Skill = 0.33A + 0.33S + 0.33T = 0.2 \cdot IDI$$

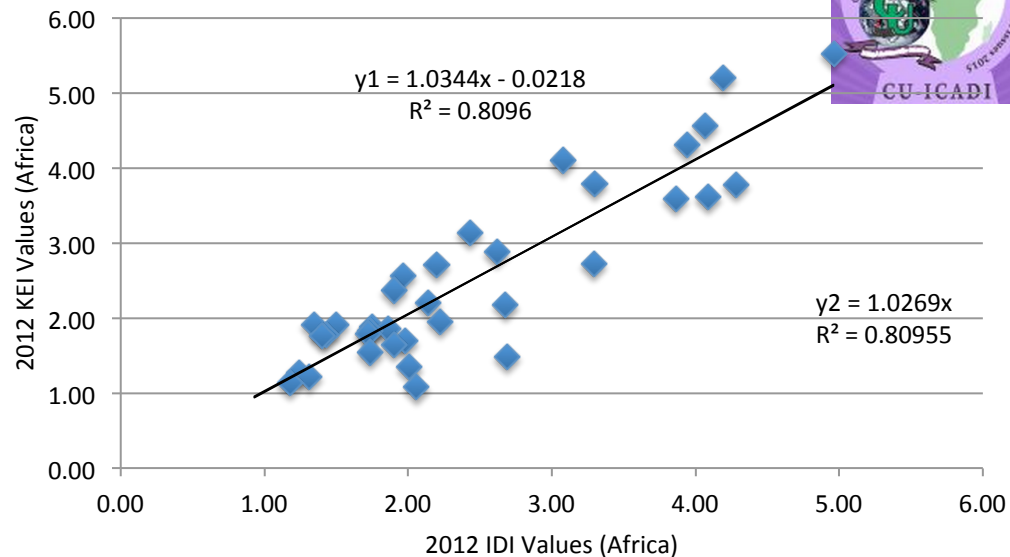
- *Ha1 is upheld (with **excellent** $R^2=1$ correlation) between ICT Education and the ICT Development Index of an economy, irrespective of its geographical location.*

b. On correlation between IDI and KEI in Africa

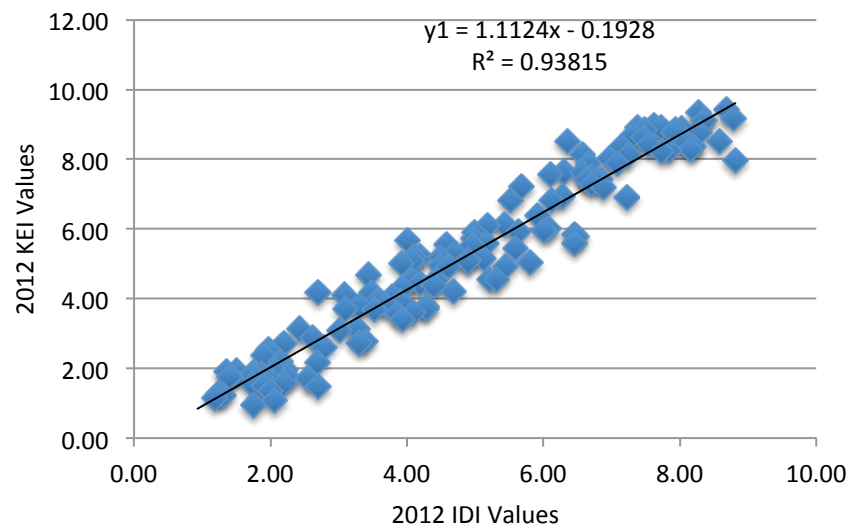
- *H02*: There is no correlation between IDI and KEI for African Nations.
- *Ha2*: There is a correlation between IDI and KEI for African Nations

s n	Economy	KEI	IDI
1	Mauritius	5.52	4.96
2	South Africa	5.21	4.19
3	Tunisia	4.56	4.07
4	Botswana	4.31	3.94
5	Namibia	4.10	3.08
6	Algeria	3.79	3.30
7	Egypt	3.78	4.28
8	Morocco	3.61	4.09
9	Cape Verde	3.59	3.86
10	Swaziland	3.13	2.43
11	Kenya	2.88	2.62
12	Ghana	2.72	3.29
13	Senegal	2.70	2.20
14	Zambia	2.56	1.97
15	Uganda	2.37	1.90
16	Nigeria	2.20	2.14
17	Zimbabwe	2.17	2.68
18	Lesotho	1.95	2.22
19	Malawi	1.92	1.50
20	Burkina Faso	1.91	1.35
21	Benin	1.88	1.75
22	Mali	1.86	1.86
23	Rwanda	1.83	1.74
24	Tanzania	1.79	1.72
25	Madagascar	1.77	1.43
26	Mozambique	1.76	1.40
27	Cameroon	1.69	1.98
28	Mauritania	1.65	1.90
29	Côte d'Ivoire	1.54	1.74
30	Sudan	1.48	2.69
31	Djibouti	1.34	2.01
32	Ethiopia	1.27	1.24
33	Guinea	1.22	1.31
34	Eritrea	1.14	1.18
35	Angola	1.08	2.06

KEI vs IDI 2012 (Africa)



KEI vs. IDI 2012 (World)



Regression Analysis Results for KEI and IDI

	Africa	World
$R^2(y1)$	0.8096 (80.96%)	0.93815 (93.82%)
$R^2(y2)$	0.80955 (80.96%)	0.93712 (93.71%)
Trendline (y1)	$y1 = 1.0344x - 0.0218$ $KEI = 1.0344 \cdot IDI - 0.0218$	$y1 = 1.1124x - 0.1928$ $KEI = 1.1124 \cdot IDI - 0.1928$
Trendline (y2)	$y2 = 1.0269x$ $KEI = 1.0269 \cdot IDI$	$y2 = 1.0791x$ $KEI = 1.0791 \cdot IDI$

Interpretation of R^2 Values

Scale	Interpretation
$R^2 \geq 90\%$	Excellent
$90\% > R^2 \geq 75\%$	Very Good
$75\% > R^2 \geq 50\%$	Good
$50\% > R^2 \geq 25\%$	Fair
$25\% > R^2 \geq 0\%$	Poor
$R^2 < 0\%$	Unsatisfactory

DISCUSSION



- Relationship between **ICTed** and Knowledge Economy has established to be a linear one with a high correlation coefficient (**$R=0.8998$**).
- According to the WBI, ICT constitutes **33.33% of the pillars** of **KI** and **25%** of the **KEI** framework.
- It is therefore imperative for African economies to find ways of addressing this all-important factor required for participating in the emerging global Knowledge Economy.
- African economies must begin to shy away from their over-dependence on exportation of raw unprocessed natural (and unskilled human) resources as the major source of GDP
- It can only be expected, that an ICT-educated populace will engender an improvement in the IDI of its country, region, or economy

CONCLUSION



- The relationship between *ICTed* – a measure of the *level of capabilities and skills* available for the exploitation of the ICTs for purposes of growth and developmental enhancement – and Knowledge Economy (*using KEI as proxy*) has been established.
- This has been done for the world as a whole and for Africa as a region of focus.
- The *skill* indicator components (**A, S, T**) have been identified as influential in affecting the KEI of Africa
- The onus now rests on African leaders and geo-political policy makers to ensure that they are given the necessary impetus in policy formulation and budgetary allocations.
- Statistics from relevant WBI, ITU, *etc*, can serve as source data for appropriate planning in this wise.

It is never too late to start taking the right steps.

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Thank You!