The ICT in North Africa Region: Facts for Sustainable Future

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المستخلص:

مع تزايد استخدام تكنولوجيا المعلومات والاتصالات ، فإن الابتكار والتطوير في قطاع تكنولوجيا المعلومات والاتصالات يتزايد ويشهدان ثورة في معظم دول العالم. و أصبح دور تكنولوجيا المعلومات والاتصالات مهماً كأدوات يمكن للحكومات نشرها في برامج الحد من الفقر لتسريع النمو الوطني. فمثلا في قارة أفريقيا ، تحقق تنمية تكنولوجيا المعلومات والاتصالات تقدما سريعا في توفير منافع اقتصادية واجتماعية هائلة للقارة ، ولكن الافتقار إلى الجودة والمعلومات المستدامة في عدد من مجالات التنمية لا يزال يمثل قضية حقيقية.

تعرض هذه الدراسة حالة تكنولوجيا المعلومات والاتصالات في الدول الموجودة في المنطقة الشمالية من قارة أفريقيا. تم إجراء دراسة المراجعة باستخدام مؤشر تطوير تكنولوجيا المعلومات والاتصالات (**IDI**). يعد **IDI** أداة قياسية لقياس الأداء ، ويستخدم لرصد ومقارنة التطورات في تكنولوجيا المعلومات والاتصالات عبر البلدان.

تظهر دراسة المراجعة المقارنة التحليلية بين دول منطقة شمال أفريقيا وتشمل تونس والمغرب وليبيا ومصر وموريتانيا والجزائر باستخدام أدوات تكنولوجيا المعلومات والاتصالات **ICT** و **IDI** كأفضل ادوات لمراقبة ورصد أي تحسن في النمو الوطني.

Abstract:

With the growing use of ICT, the innovation and development in the ICT sector is increasing and witnessing a revolution in the most of world countries. The role of ICTs becomes important as tools that governments can deploy in their poverty reduction programs to accelerate the national growth. In the Africa continent, the ICT development is making rapid progress offering huge economic and social benefits for the continent,

but the lack of quality and sustainable information in a number of development areas remains a real issue.

This study presents the state of ICT in the development nations located in the north region of Africa continent. This review study is carried out using the ICT Development Index (IDI). The IDI is a standard tool for benchmarking, and it is used to monitor and compare developments in information and communication technology (ICT) across countries.

The review study shows analytical comparison between the North Africa Region Countries includes Tunisia, Morocco, Libya, Egypt, Mauritania and Algeria using ICT and IDI tools as the best ones to monitor and notice any improvement in national growth.
Keywords: ICT, IDI, Internet, Mobile, Fixed line.

I. Introduction

The ICT stands for Information and Communication Technology and defined as divers set of technological tools and resources used to communicate, produce, disseminate, accumulate, and manage information. These technologies include radio, TV, computers, fixed lines telephones, mobile communications, and Internet. ICT has become a prominent and crucial sector which is widely used in the entire world for many important and different purposes, such as business, health, transport, communication, and education [1]. As a result, the ICT has played a significant role in the economic growth for developed and developing countries in the world. In Africa continent, Information and Communication Technology (ICT) has been making considerable progress since the beginning of the 21st century. The ICT developments can be used as determining factor and instruments for general growth, this factor and instruments, including not only computer hardware and software but also fixed telephones, mobile telephones, telecommunication equipment and wireless transmission equipment.

Currently, total worldwide mobile subscription have grown to 7 billion and mobile internet subscription to 3 billion at the end of 2014, and these numbers are expected to double within five years. The increase is mostly due to growth in the developing world [2]

Timely and comparable data remains a major barrier to analyzing the status and progress of Information and communication technologies, identifying reliable targets and adapting policies.

This paper presents a study about the Arab countries which are located in the north of Africa continent in terms of the usage of the ICT. The purpose of this paper is to identify and present opportunities for ICTs development, and determine a collaborative framework for ICTs for North African countries, premised on the developmental indices for establishing an information and knowledge society

Also, this study is carried out using the ICT Development Index (IDI). The ICT Development Index (IDI) is a composite index combining some indicators into one benchmark measure that serves to monitor and compare developments in information and communication technology (ICT) across countries [2].

II. Literature Review

Africa is the world's second-largest and second-most-populous continent. At about 30.2 million km^2 including adjacent islands, it covers six percent of earth's total surface area and 20.4 percent of its total land area [3]. With 1.1 billion people as of 2013, it accounts for about 15% of the world's human population [4]. The continent is surrounded by the Mediterranean Sea to the north, both the Suez Canal and the Red Sea along the Sinai Peninsula to the northeast, the Indian Ocean to the southeast, and the Atlantic Ocean to the west.

Africa is considered as a vast continent with huge contrasts and non-homogeneous development of telecommunications and ICTs. These contrasts are evident even within the sub regions themselves and also within individual countries. It is tempting to simplify the grouping of African Countries into three groups as the relatively well developed Northern African and South Africa, and the least developed sub-Saharan Africa.

Virtually all major indicators e.g. GDP per capita, ICT, human development index, literacy, power consumption, child mortality, life expectancy, …etc easily betray Africa as being at the tail of the other continents. While the continent has 15% of the world population, its share of world GDP is only 1%, while it has 17% of the world phones and barely 1.5% of the global Internet users. One of the most cited statistics is that in 1984 the continent had fewer phones than the city of Tokyo and in 2002 it had less Internet users than London. [5]

In the most countries of the world ICT infrastructure is expanding and modernizing. Recognizing the critical role of information and

communication technology in economic development, governments have been pouring large sums into expanding and improving local infrastructures. As a result ,the gap separating the developing and the developed countries has been shrinking in many types of ICT such as number of mobile subscribers, number of fixed telephone lines and Internet users … etc.

According to the Commonwealth of Learning report, which provided a good summary of ICT developments in Africa, The Radio is the most widespread communications medium on the continent. About the Internet connection, 49 of 54 countries and territories in Africa have Internet access in their capital cities [5]. Only 17 countries have Internet servers in their secondary towns, imposing the requirement for long distance calling in order to access the service. The Internet Service Provider (ISP) subscription fee was estimated to an average of US$ 50/month. Each computer in Africa with an Internet connection has an average of three users. The Internet access levels in Africa are one user for every 1400 people compared to a world average of one user for every 35 people and a North American average of one user for every 3-4 people.[6]

In addition to the internet access level, Mobile subscriptions is another indicator of the ICT developments. Mobile subscriptions in the developed world is rapidly reaching saturation point. There are 1.5 billion subscriptions in developed nations, which is similar to 2013. With 120.8 percent mobile penetration, there is already more than one mobile subscription per person in developed nations, leaving little room for growth [2].

In Africa continent, the penetration has grown at 69 per cent by end 2014, which is considered the region with the strongest mobile-cellular growth. The growth trend in Africa is not different. It is expectation that the mobile subscriber base will rise to 100 per cent billion at the end of 2015 [2]. This growth therefore requires more reliable and sustainable infrastructure for effective operation.

To analyze the real use and potential of ICTs, it is imperative that countries carry out representative household and individual ICT surveys. Few African and Arab countries currently do so, though. This adds to the already existing statistical divide on access to, and use of, ICTs [7].

Table 1 presents a simple comparison between four zones of the globe classified as developed countries, developing countries, Africa continent countries and Arab countries.

Table 1 Key Global Telecom Indicators for the World Telecommunication Service Sector in 2014 [2]

Key indications	Developed nations	Developing nations	Africa	Arab States
Mobile cellular subscriptions (millions)	1,515m	5,400m	629m	410m
Per 100 people	120.8%	90.2%	69.3%	109.9%
Fixed telephone lines (millions)	511m	636m	12m	33m
Per 100 people	40.8%	10.6%	1.3%	8.7%
Active mobile broadband subscriptions (millions)	1050m	1265m	172m	92m
Per 100 people	83.7%	21.1%	19.0%	24.0%
Mobile broadband growth	11.5%	26%	43%	19%
Fixed broadband subscriptions (millions)	345m	366m	3m	12m
Per 100 people	27.5%	6.1%	0.4%	3.1%

Table 1 showed that Africa has the lowest growth in all aspects of the ICT compared with the other regions in the world. This indicates that the African ICT environment and infrastructure faces tremendous challenges. Africa is one of the poorest regions in the world and has the

lowest access to information and communication resources, which means that there are still challenges for Africa continent in the ICT sector, therefore, the opportunity to invest in the ICT sector and the ICT market in Africa is significant. A number of African countries have made progress on access to ICT services but the continent largely lags behind the rest of the world.

III. Information and Communication Technology Development Index (IDI)

The ICT Development Index (IDI), which has been published annually since 2009, is a composite index that combines 11 indicators into one benchmark measure. It is used to monitor and compare developments in information and communication technology (ICT) between countries and over time [9].

The main objectives of the IDI are [9]:

- To measure the level and evolution over time of ICT developments within countries and the experience of those countries relative to others;
- To measure progress in ICT development in both developed and developing countries;
- To measure the digital divide, i.e. differences between countries in terms of their levels of ICT development; and
- To measure the development potential of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

The Index is designed to be global and reflect changes taking place in countries at different levels of ICT development. It therefore relies on a limited set of data which can be established with reasonable confidence in countries at all levels of development. Based on this conceptual framework, the IDI is divided into the following three sub-indices:

- Access sub-index: This sub-index captures ICT readiness, and includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, households with a computer, and households with Internet access).

- Use sub-index: This sub-index captures ICT intensity, and includes three intensity and usage indicators (individuals using the Internet, fixed broadband subscriptions, and mobile-broadband subscriptions).
- Skills sub-index: This sub-index seeks to capture capabilities or skills which are important for ICTs. It includes three proxy indicators (mean years of schooling, gross secondary enrolment, and gross tertiary enrolment). As these are proxy indicators, rather than indicators directly measuring ICT-related skills, the skills sub-index is given less weight in the computation of the IDI than the other two sub-indices.

IV. The IDI Calculation

The above mentioned three Sub-indices were computed by summing the weighted values of the indicators included in the respective subgroup as follows:

- ICT access is measured by fixed-telephone subscriptions per 100 inhabitants, mobile-cellular subscriptions per 100 inhabitants, international Internet bandwidth per Internet user, the percentage of households with Internet computer and the percentage of household's access.

- ICT usage is measured by the percentage of individuals using the Internet, fixed-broadband Internet subscriptions per 100 inhabitants and active mobile-broadband subscriptions per 100 inhabitants.

- ICT skills are approximated by mean years of schooling, secondary gross enrolment ratio and tertiary gross enrolment ratio.

V. The ICT Situation in North Africa

Many analysts of African issues find it quite convenient to group African countries into three groups, the North, South Africa and Sub-Saharan Africa.

North Africa, consisting of the six States, is the most advanced sub-region in telecommunications and ICT development as reflected by its various indicators. It is well connected with submarine cables in the Mediterranean.

The oil and gas wealth in this sub-region has brought overall relatively good socio economic development and peace. Given this situation, these countries hold a potential of extending investments into other countries south of the Sahara to boost ICT development.

The following table 2 [8], is the status of the information and communication technology (ICT) markets in six Arab countries located in North Africa region, including significant infrastructure developments, and government policy and initiatives to improve the access and use of ICTs for households and individuals.

Table 2. ICT in North Africa Countries [8]

Key indications (2017)	**Algeria**	**Egypt**	**Libya**	**Morocco**	**Mauritania**	**Tunisia**	**Arab States**	**World**
Fixed telephone sub. Per 100 inhab	8.2	7.1	21.5	6.0	1.3	8.6	7.7	16.6
Mobile cellular sub. Per 100 inhab	113.9	113.7	119.8	120.7	86.5	125.8	107.1	101.5
Fixed – broadband sub. Per 100 inhab	6.9	5.2	2.6	3.7	0.3	5.6	4.7	12.4
Active mobile-broadband sub. Per 100 inhab	64.6	52.6	34.9	46	30.2	63	45.2	52.2
3G coverage (% of population)	83.4	98.7	78.1	95	41	99	81.9	85
LTE/WiMAX coverage (% population)	3.6	0.0	n.a.	68	00	73	33.8	66.5
Mobile –	2.5	0.8	1.3	4.4	16.3	0.9	4.3	5.2

cellular prices (% GNI pc)								
Fixed – broadband prices (%GNI pc)	3.6	1.8	4.4	4	10	1.4	10.1	13.9
Mobile – broadband prices 500MB (% GNI pc)	2.6	0.7	1.5	2	29.2	1.4	4.5	3.7
Mobile – broadband price BB (% GNI pc)	5.4	0.9	2.2	4	29.2	1.1	5.5	6.8
percentage of households with computer	38.4	53.1	23.5	54.9	5.0	39.3	43.3	46.6
Percentage of households with internet access	34.7	43.3	22	68.5	11.2	37.5	45.3	51.5
Percentage of individuals using the internet	42.9	39.2	20.3	58.3	18	49.6	41.8	45.9
Int. internet BW per internet user (k bit/s)	40	17.2	5.5	25.7	4.5	32	39	74.5

The three IDI Sub-indices for the six North African countries which are involved in this study are summarized in the following table:

Table 3: IDI for 6 Arab states in North Africa region [10]

Country	IDI Access sub index	IDI use sub index	IDI skills sub index	IDI 2017 rank	IDI 2017 value
Algeria	5.14	3.38	6.29	102	4.67
Egypt	5.40	3.35	5.66	103	4.63
Libya	4.80	1.98	6.99	115	4.11
Morocco	6.06	3.68	4.35	100	4.77
Mauritania	2.96	1.62	2.15	151	2.26
Tunisia	5.11	4.11	5.67	99	4.82

From the previous table, it can be noticed that Tunisia is ranked as the best country in North Africa Arab states in field of communication and information technology and the lowest is Mauritania for the last year 2017.

VI. Conclusion

Information and communication technologies (ICT's) have the impact effect on the societies around the globe. ICT market in North Africa region will see more innovation. Internet users and Internet penetration rates are low in the most of these countries. Operators will be forced to update their network infrastructure to accommodate increased demand for broadband.

The result of this paper demonstrates that the North Africa countries; Algeria, Egypt, Libya, Morocco, Mauritania and Tunisia are not powerhouses of ICT. ICT skills will remain one of the biggest challenges facing those countries. Moreover, all countries in this region need new ICT policies and need to do more investments in the ICT infrastructure. There are specific interventions that the Africa Continent in general and North Africa countries can develop to sustain and further grow the ICT sector.

Despite critical political situation in Libya (war 2011), it has the highest IDI skills sub index between the 6 countries.

IDI reflects the infrastructure of the country itself accordingly Tunisia is the best between the mentioned 6 Arab countries.

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