Digital Competence and Digital Gap in Arab World

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الملخص: تهدف هذه الورقة البحثية إلى فهم الفجوة الرقمية في العالم بصفة عامة والعالم العربي على وجه الخصوص، بالإضافة إلى قياس الفجوة الرقمية في العالم العربي من خلال الاعتماد على مؤشر تنمية تكنولوجيا المعلومات والاتصالات الصادر عن الاتحاد الدولي للاتصالات، ويعتمد الاتحاد الدولي في قياس الفجوة الرقمية على ثلاثة أبعاد: النفاذ لتكنولوجيا المعلومات والاتصال؛ استخدام تكنولوجيا المعلومات والاتصال؛ والمهارات المعتمدة في تكنولوجيا المعلومات والاتصال.

الحديث عن الفجوة الرقمية يقودنا إلى الحديث عن الكفاءةوالأهمية الرقمية. وفي هذا الصدد، أظهرت هذه الدراسة أهمية الكفاءة الرقمية للعمل والتعلم وحتى العيش في عالم اليوم. وفي الأخير أظهرت النتائج أن: الفجوة الرقمية واحدة من أهم التحديات بالنسبة للبلدان العربية، وأنالكفاءة الرقمية واحدة من متطلبات الاقتصاد الرقمي وغيابها يوسع من الفجوة الرقمية؛ وأن الفجوة الرقمية بين الدول المتقدمة والدول العربية آخذة في الاتساع، وبالتالي يجب وضع استراتيجيات لمعالجتها.

الكلمات المفتاحية: اقتصاد رقمي، كفاءة رقمية، فجوة رقمية، أمية رقمية.

Abstract : This paper discusses about the digital gap or digital divide.it focus to understand the digital gap in the world in general and in the Arab world in particular. More specifically, it aims to measure the digital divide in the Arab world using the developed ICT Index that published by the International Telecommunication Union (ITU). The method of this index is to measure digital gap in three dimensions: the ICT access, ICT use and ICT skills. Talking about the digital gap leads us to talk about digital competence and digital literacy. In this regard, this study showed the importance of digital competence for work, learn and even live in today's world. Finally, the results show that: the digital gap one of the most important challenge in the Arab countries; digital competence is a requirement of the digital economy and its absence widens the digital divide; and the digital divide between developed and Arab countries is widening, and therefore strategies must be developed to address them.

*Key Words***:** Digital Economy, Digital Competence, Digital Gap, Digital literacy
JEL Classification : O33, P47, P59.

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Introduction:

Digital economy is not only a new economy that based on technology, it is a revolution that is happening right now in the world, digital technologies are impact the business, government, and individual's lives. Digital economy now is a new driver of development. To accelerate digitization of the Arab world, it must reduce what is known as the digital divide, which is a challenge in the current digital revolution.

Digital competence is the modern competence that is the most important in the digital world. Digital competence is the ability to keep abreast with the rapid changes in the area of ICT. It comprises the related knowledge and skills you need have to exploit ICT efficiently for your own purposes, be it for your personal or professional life.

Digital Divide or Digital gap can be defined as a 'technological' gap between individuals, families, social groups, countries and geographic areas based on their opportunities to access ICT and use the Internet for a wide range of activities. Digital gap is one of the most challenge in the world especially in developing countries. The change to the digital economy is widening the gap, making it difficult for countries without technology to integrate into the global economy. In this context, and through ofthis research, we try to answer the following problematic: How can Arab countries reduce the digital gap?and What are the digital competencies required for this?

Research Structure:

This research was divided to:

- – Introduction;
- – Digital Economy Concept;
- – Requirements of the digital economy;
- – Challenges of the digital economyin Arab world;
- – Conclusion.

1. Digital Economy Concept:
1.1. Definition:

Definitions are always a reflection of the times and trends from which they emerge. One can see this in the technologies encompassed. Early definitions focus specifically on the internet, reflecting its emergence during the 1990s as a mainstream technology, at least in the global North. Later definitions add new technologies such as mobile and sensor networks, and cloud computing data. Or they opt for the more generic notion of « digital technologies » as per the simple definitions (Bukht.R & Heeks. R, 2017).

The "digital economy" is sometimes defined narrowly as online platforms, and activities that owe their existence to such platforms, yet, in a broad sense, all

activities that use digitized data are part of the digital economy: in modern economies, the entire economy(IMF, 2018).

Table (1): Evolving definitions and concepts of the digital economy

Source	Definition	Focus
Tapscott 1996: The Digital Economy: Promise and Peril in the Age of Networked Intelligence	No direct definition but called it the "Age of Networked Intelligence" where it is "not only about the networking of technology… smart machines… but about the networking of humans through technology" that "combine intelligence, knowledge, and creativity for breakthroughs in the creation of wealth and social development"	Said to have first coined the term "digital economy". Emphasized that the digital economy explains the relationship between the new economy, new business and new technology, and how they enable one another.
Lane 1999: Advancing the Digital Economy into the 21st Century (Assistant to the US President for Science and Technology)	"…the convergence of computing and communication technologies in the Internet and the resulting flow of information and technology that is stimulating all of electronic commerce and vast organizational changes".	Focused on e-commerce and the wider ramifications of the digital economy around issues such as privacy, innovation, standards, and the digital, divide.
Margherio et al. 1999: The Emerging Digital Economy (US Commerce Department)	No explicit definition but identified four drivers: "Building out the Internet ... Electronic commerce, among businesses ... Digital delivery of goods and services ... Retail sale of tangible goods".	First clear segmentation of the digital economy. Emphasized foundations of digital economy more than economy itself.
Brynjolfsson and Kahin 2000: Understanding the Digital Economy: Data, Tools, and Research	"...the recent and still largely unrealized transformation of all sectors of the economy by the computer-enabled digitization of information".	Emphasized understanding the digital economy from various angles: macroeconomics, competition, labor, organizational change.
OECD 2013: The Digital Economy	"The digital economy enables and executes the trade of goods and services through electronic commerce on the Internet"	Main content relates to competition and regulation in digital markets, with additional discussion of network effects, interoperability, and open vs. closed platforms
European Commission 2013: Expert Group on Taxation of the Digital Economy	"...an economy based on digital technologies (sometimes called the internet economy)".	Identifies characteristics of digital economy companies: ✓ innovation through new sources of finance (venture capital) ✓ importance of intangible assets ✓ new business models based on network effects ✓ cross-border e-commerce

Source: (Bukht.R & Heeks. R, 2017)

As scientific progress and technology innovation continues to march one, the emerging knowledge economy will create a new frontier of opportunities impacting new job market and career trends. Newsweek Magazine and World Future Society Millennium forecast the following emerging economy(Uddin.M, 2017):

- Information technology will define a new global culture;
- Nanotechnology – The micro manipulation of materials at the molecular level will radically transform the physical sciences;
- Electronic immigrants will make up the emerging workforce of the digital economy;
- Virtual Reality will simulate the future environment for work, leisure, education and research;
- Information Management Systems and the Computer Aided infrastructure will define the evolution of intelligence;
- Computer Aided customization will aid from design to prototype to production (i.e.: factory of the future);
- Bio-technology and genetic engineering will extend the human life span;
- Distance Education and inter-active multi-media will create a new freedom of lifelong learning;
- The new atomic age through thermo-nuclear fusion will provide unlimited energy needs;
- The new space age will provide alternative resources for sustaining human life on earth.

1.2. Digital Economy and Traditional Economy:

The New Economy is structurally different in many ways from the Old Economy. The latter is based on hardware, whereas software is the defining characteristic of the New Economy. Value added in the New Economy comes from the creation of new knowledge rather than the application of existing knowledge, as in the Old Economy. The current transition from the Old Economy toward the New Economy is therefore a transition from the industrial age of making and consuming products to the information age of creating and absorbing knowledge. While the focus of the Old Economy is on transforming raw materials into goods and services, the focus of the New Economy lies in transforming intellectual capital into new information and knowledge(Kehal & Singh, 2005).

Table (2): comparison between the digital economy and the traditional economy

ISSUE	Traditional Economy	Digital Economy
Economy – Wide Characteristics: • Markets • Scope of Competition	– Stable – National	– Dynamics – Global
Organizational Form Industry: • Organization of Production • Key Drivers of Growth • Key Technology Driver • Source of Competitive Advantage • Importance of Research/Innovation • Relations with Other Firms	– Mass Production – Capital/Labor – Mechanization – Lowering Cost Through Economics of scale – Low-Moderate – Go It Alone	– Flexible Production – Innovation/Knowledge – Digitization – Innovation, Quality, Time-To-Market, and cost – High – Alliances and Collaboration
Workforce: • Policy Goal • Skills • Requisite Education • Labor-Management Relations • Nature of Employment	– Full Employment – Job-Specific Skill – A Skill or Degree – Adversarial – Stable	– Higher Real Wages and Incomes – Broad Skills and Cross-Training – Lifelong Learning – Collaborative – Marked by Risk and Opportunity
Government: • Business-Government Relations	– Impose Requirements	– Encourage Growth Opportunities

Source:(Uddin.M, 2017)

The Digital economy is an economy based on technology and human capital. Today, all country in the world try to transform to this new economy as a new driver of development.In this regard, many Arab countries are beginning to wake up to the challenge in the digital society especially the Gulf countries that have succeeded in the transition into the digital economy such as the UAE and Qatar through investment in technology.

2. Requirements of the digital economy:
2.1. Digital Competence:

Digital competence is the most recent concept describing technology-related skills. During the recent years, several terms have been used to describe the skills and competence of using digital technologies, such as ICT skills, technology skills, information technology skills,21st century skills, information literacy, digital literacy, and digital skills(Ilomaki & al, 2011).

Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), and problem solving. Annex to the Proposal for a Council Recommendation on Key Competences for Lifelong Learning (EC, Being Digitally competent:a task for the 21 st century citizen,, 2018,).

Figure (1): Digital Competence
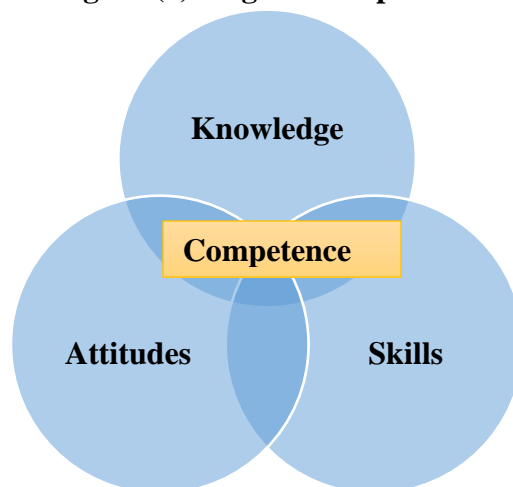
Source:(EC, Digital Competence Framework for Citizens,, 2014)

The Digital Competence can be used in different context to support citizens to live and work in an increasing digital society. Digital competence can help(EC, Digital Competence Framework for Citizens,, 2014).

- Citizens with no or low abilities to use ICT in daily life in order to identify the most essential skills to improve their personal and professional lives. The ability to use ICT effectively is an essential life skill.
- Jobseekers to identify the acquired skills and their proficiency level when developing their CV.They can also compare these against job vacancies to

identify the skills they are lacking and search for further skills development and learning opportunities.

- Employers to define the set of skills, competences and qualifications their vacancies require when they are developing a job description.
- Employment services can use the digital competence to exchange relevant labor market information in a meaningful way and offer adequate career guidance.
- Education and training institutions and lifelong learning organizations to use the framework in curriculum development, learning outcomes and assessment as well as for innovating learning services.

The European Commission has developed framework to measure the digital competencein the following table.

Table (3): Areas of Digital Competence

Competence areas	Competences
1.Information	1.1 Browsing, searching, filtering information 1.2 Evaluating Information 1.3 Storing and retrieving information
2.Communication	2.1 Interacting through technologies 2.2 Sharing information and content 2.3 Engaging in online citizenship 2.4 Collaborating through digital channels 2.5 Netiquette 2.6 Managing digital identity
3.Content creation	3.1 Developing content 3.2 Integrating and re-elaboration 3.3 Copyright and Licenses 3.4 Programming
4.Safety	4.1 Protecting devices 4.2 Protecting data and digital identity 4.3 Protecting health 4.4 Protecting the environment
5.Problem solving	5.1 Solving technical problems 5.2 Expressing needs and identifying technological responses 5.3 Innovating, creating and solving using digital tools 5.4 Identifying digital competence gaps

Source:(EC, Digital Competence Framework for Citizens,, 2014).

According to the last table we can say that digital competence is very important, to learn, work and even live in today's world.so, the digital economy needs a different competence thanwhat existed in the traditional economy. The absence of digital competence is delaying countries in digital transformationand leads to the digital divideor digital gap.

2.2. Digital Literacy:

Digital literacy should be understood to mean the basic skill or ability to use a computer confidently, safely and effectively, including(Gov.mt, 2015):

the ability to use office software such as word processors, email and presentation software, the ability to create and edit   images, audio and video, and the ability to use a web browser and Internet search engines. These are the skills that teachers of other subjects at secondary school should be able to assume that their pupils have, as an analogue of being able to read and write."

We often hear people talk about the importance of digital knowledge for 21st-century learners. Unfortunately, many foci on skills rather than literacies. Digital skills focus on what and how. Digital literacy focuses on why, when, who, and for whom (Bali.M, 2016).

For example, teaching digital skills would include showing students how to download images from the Internet and insert them into PowerPoint slides or webpages. Digital literacy would focus on helping students choose appropriate images, recognize copyright licensing, and cite or get permissions, in addition to reminding students to use alternative text for images to support those with visual disabilities(Bali.M, 2016),this is the main difference between digital competence and digital literacy.

They are three stage model of digital literacy and refer to the following three levels(Gov.mt, 2015):

- **Digital Competence** that is the skills, concepts, approaches and attitudes;
- **Digital Usage** that refers to the application of digital competence within a specific context such as a school; and
- **Digital Transformation** which involves   creativity and innovation in the digital domain. Digital literacy has become a prerequisite for creativity, innovation and entrepreneurship and without it citizens can neither participate fully in society nor acquire the skills and knowledge necessary to live in the 21st century.

Table (4): Traditional Literacy and digital Literacy

Traditional Literacy	digital Literacy
Finding information	Vetting information
Reading(emersion)	Skimming (searching for solutions)
Note-taking	Curating
Transcribing	Linking
Prose composition	Multimodal composition
	Information design
	Data visualization
	Dynamic storytelling(video)
	Coding/programming
Static artifacts	Dynamicassets (multiple, diverse, reusable)
Learns from teachers	Teaches self
Permanence	Change

Source:(Ventimiglia.P & Pullman.G, 2016)

Many early digital literacy efforts in higher education focused on providing a single class that covered base-level skills, such as creating a PowerPoint presentation or spreadsheet. But what is truly needed in higher education today is integration of digital literacy throughout the curriculum, so that students are able to do the following (Ventimiglia.P & Pullman.G, 2016):

- **Find information online**. In the digital world, being able to not only find information online but also determine its quality and validity is crucial.
- **See problems from digital perspectives**. Students need to be able to analyze a problem and determine how to use digital tools to solve it. For example, can a problem be solved more quickly by creating a spreadsheet or by working the problem manually?
- **Become self-directed learners**. The Internet has put all of the world's knowledge at our fingertips. Students should know how to take advantage of that availability of information to become lifelong learners.
- **Obtain digital solutions**. Technology is constantly changing. Students must learn how to evaluate and buy the right digital tools to solve the problem at hand, rather than just relying on the tools they have used in the past.
- **Learn software quickly**. Software is also always changing and improving, so students need to be able to quickly teach themselves new tools. For example, whereas being an expert in spreadsheets was an important quantitative skill set in the past, now it is increasingly important to be an expert in visualization tools such as Tableau.
- **Design and create digital solutions**. Ultimately students should build a skill set that allows them to develop or customize their own digital tools. This does not necessarily mean that students need to be able to write their own applications from scratch. Rather, they should be comfortable customizing and combining tools to create a complete solution—for example, creating a web-

form to automate the collection of customer evaluations and then outputting the results to a spreadsheet for analysis.

3. Challenges of the digital economyin Arab world:
3.1. Contribution of the digital economy:
Digital contribution to Middle East economy is low compared with benchmarks(Mckinsey, 2016). The rest of the Arab countries such as Algeria, Morocco and Tunisia are still lagging behind in the transition to the digital economy.

Figure (2): Share of digital contribution to GDP, %

<div align="right">
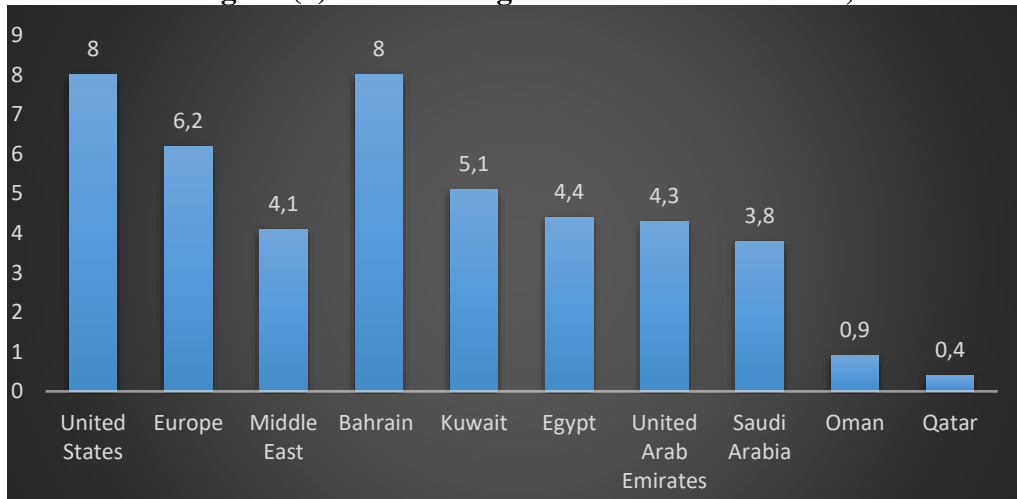
Source:(Mckinsey, 2016)

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The contribution of the digital economy in the United States was 8%, while in Europe it was 6.2%, and in the Middle East it was low with contribution 4.1% to GDP.

3.2. Digital gap:
A concept which is often discussed together with digital skills is digital divide: concepts digital competence / digital skills are often used when investigating the digital divide. Digital divide was originally used to describe different social groups' unequal access to digital services, and differing abilities to make use of various digital possibilities(Ilomaki & al, 2011).

OECD's definition: Gap between individuals, households, businesses and geographic areas at different socio-economies levels with regard both to their opportunitiesto access ICTs and to their use of the internet for a wide variety of activities(ITU, how to measure the digital divide?, 2004).

A concept which is often discussed together with digital skills is digital divide: concepts digital competence / digital skills are often used when investigating the digital divide(Ilomaki & al, 2011).

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. The main objectives of the IDI are to measure(ITU, The ICT Development Index: conceptual framework):

- The level and evolution over time of ICT developments within countries and the experience of those countries relative to others;
- Progress in ICT development in both developed and developing countries;
- The digital divide, i.e. differences between countries in terms of their levels of ICT development; and
- 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.

Measuring the digital divide between Arab and developed countries depends on IDI Development Index, and we explain its indicators in the following table.

Table (5): IDI Development Index

ICT Access
1.Fixed-telephone subscriptions per 100 inhabitants;
2. Mobile-cellular telephone subscriptions per 100 inhabitants;
3. International internet bandwidth per Internet user (Bit/s);
4. Percentage of households with computer;
5. Percentage of households with Internet access.
ICT Use
6. Percentage of individuals using the Internet;
7.Fixed (wired)-broadband subscriptions per 100 inhabitants;
8.Active mobile-broadband subscriptions per 100 inhabitants.
ICT Skills
9.Mean years of schooling;
10.Secondary gross enrolment ratio;
11.Tertiary gross enrolment ratio.

**Source:**(ITU, The ICT Development Index: conceptual framework).

The country with the highest IDI ranking in 2017 is Iceland, with an IDI value that has risen from 8.78 in 2016 to 8.98 in 2017(ITU, Measuring the Information Society Report, 2017),for the ranking of the Arab countries is shown in the following table:

Table (6): IDI Arab Rank 2017

Economy	Regional rank 2017	Global rank 2017
Bahrain	1	31
Qatar	2	39
United Arab Emirates	3	40
Saudi Arabia	4	54
Oman	5	62
Lebanon	6	64
Jordan	7	70
Kuwait	8	71
Tunisia	9	99
Morocco	10	100
Algeria	11	102
Egypt	12	103
Libya	13	115
Palestine	14	123
Syria	15	126
Sudan	16	145
Mauritania	17	151

Source:(ITU, Measuring the Information Society Report, 2017)**.**

A number of countries from the Arab States region with relatively high IDI values – Bahrain, Qatar, Oman and the UAE with IDI values more than 7. Most Arab countries with lower IDI values were unable to improve their IDI level.

Figure (3): Arab States IDI Global Comparisons
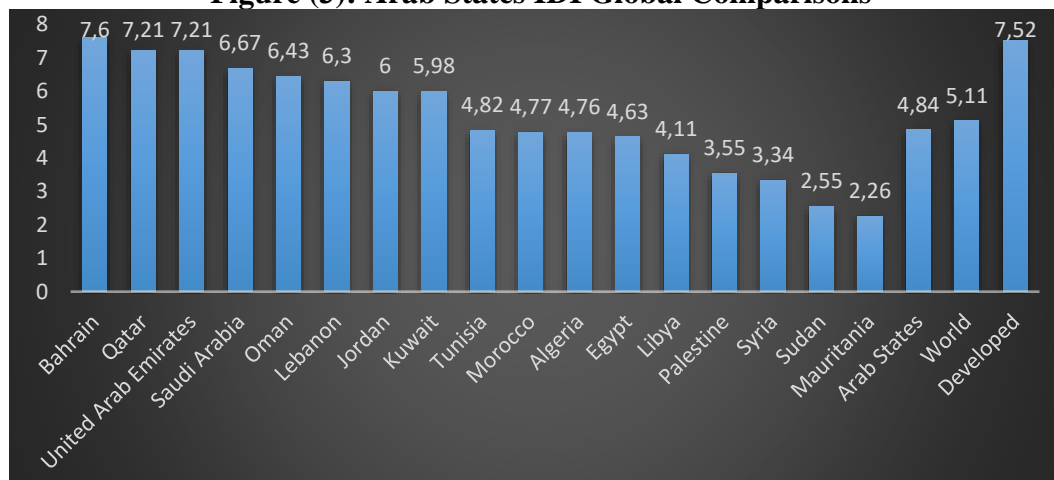
Source: established by authors based on:(ITU, ICT Development Index, 2017)

According to the ITU2017 report, Bahrain tops the regional ranking, with an IDI of 7.6, followed by the Qatar and UAE. Then, Saudi Arabia, Oman, Lebanon, Jordan and Kuwait these countries boast a higher IDI than the global average of 5.11. ICT index based on three dimensions:

- **ICT Access**: indicators included in this group provide an indication of the available ICT infrastructure and individuals' access to basic ICTs(ITU, The ICT Development Index: conceptual framework).

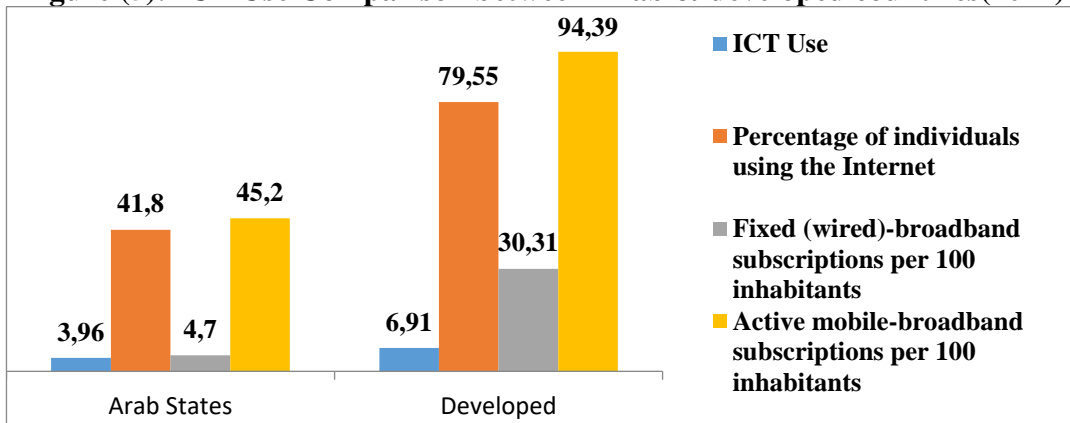**Figure (4): ICT Access Comparison between Arab & developed countries2017**
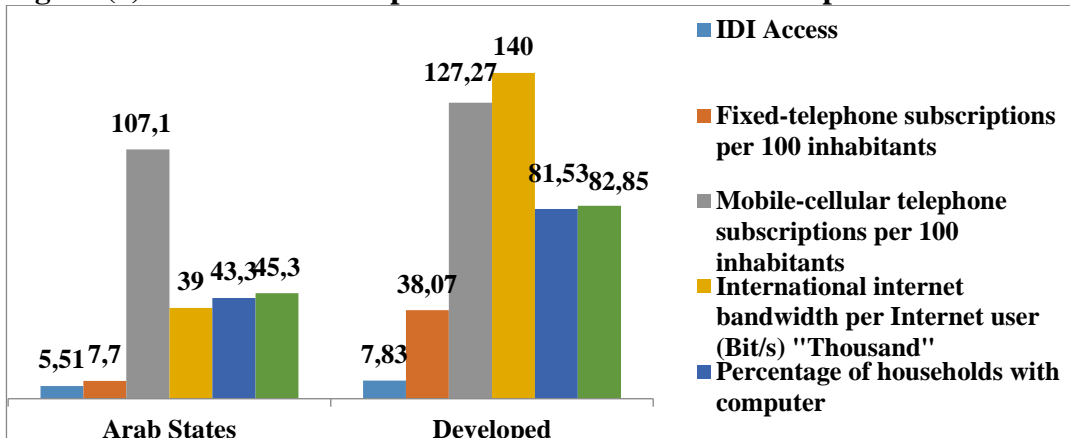
Source: established by authors based on:(ITU, ICT Development Index, 2017)**.**

The value of the access sub-index in Arab states is 5.51 less than the average value in the world that reached at 5.59, and by a difference of more than two points from the developed countries. Most Arab countries have low levels of ICT access as a result of low investment in ICT infrastructure, low quality network.

- **ICT Use:** The indicators included in this group capture ICT intensity and usage(ITU, The ICT Development Index: conceptual framework).

Figure (5): ICT Use Comparison between Arab & developed countries(2017)
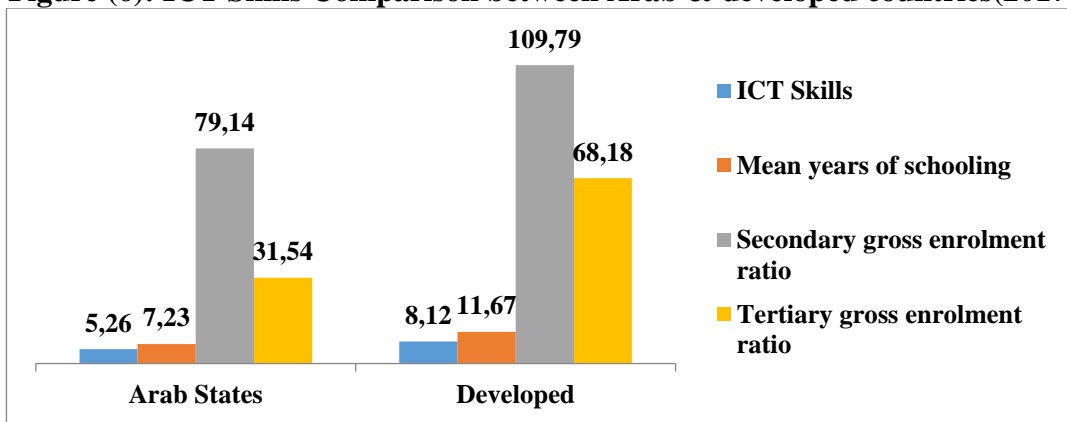

Source: established by authors based on:(ITU, ICT Development Index, 2017).

According to the ITU2017 report, the average value in the world on ICT use is 4.26, while its value is in Arab countries 3.96. The main results for this is from a substantial fall in the number of active mobile-broadband subscriptions and the number of individuals using the internet.

- **ICT Skills:** data on mean years of schooling and gross secondary and tertiary enrolment ratios are collected by the United Nations Educational, Scientific and Cultural Organization Institute for Statistics(ITU, The ICT Development Index: conceptual framework).

Figure (6): ICT Skills Comparison between Arab & developed countries(2017)

Source: established by authors based on :(ITU, ICT Development Index, 2017)

According to figure (6) the ICT skills values in Arab states was 5.26 by a difference of 3 points from the developed countries. The main challenge in this dimension is to invest in human capital by raising the level of learning and training.

Discussion and Conclusion:

This study used ICT development index to investigate and examine the digital divide in the Arab countries. Measuring the gap is the basis for measuring progress towards the information society, which depends on balancing the different dimensions of the ICT experience in different countries.

Today, there is a widening digital Gap between Arab and developed countries. This widening digital divide is a cause of particular concern in light of the role that ICTs are expected to play in efforts to achieve the Sustainable Development Goals.

In the ITU report of 2017, access sub-index indicators (Fixed-telephone subscriptions per 100 inhabitants; Mobile-cellular telephone subscriptions per 100 inhabitants; International internet bandwidth per Internet user (Bit/s); Percentage of households with computer; Percentage of households with Internet access) showed the low levels of ICT access as a result of low investment in ICT infrastructure.

Furthermore, use sub-index indicators (Percentage of individuals using the Internet; Fixed (wired)-broadband subscriptions per 100 inhabitants; Active

mobile-broadband subscriptions per 100 inhabitants) prove that the usage of information technology in the Arab world is low compared to the world average and developed countries

Also, skills use sub-index indicators (Mean years of schooling; Secondary gross enrolment ratio; Tertiary gross enrolment ratio.) show that there is a direct relationship between human development and digital gap.

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