The Impact of COVID-19 on Information Technology industry: A Comparison Study Between the Top Digital Countries in Middle East and Egypt

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Abstract: With the beginning of 2020, the COVID-19 global pandemic emerged which in turn affected the economic sectors worldwide. This impact varies from one country to another depending on the strength of the country economic system and its ability to cope with the crisis. Information technology played a major role in facing the repercussions of the crisis by activating remote working, distance learning and online shopping and other electronic practices. It also has a role in helping health sector to discover cases, trace and deal with cases remotely, among others. This paper provides a comparative study between the impact of COVID-19 on IT industry in Middle East countries and Egypt by reviewing the achievements of information technology in Middle East countries and Egypt. It clears that Egypt is one of the pioneer countries in developing its information technology sector and transforming digitally, however, it still need more efforts in this regard.

INTRODUCTION

COVID-19 is the worst crisis that the world has witnessed, since, the Second World War[1]. Thus, the World Health Organization declared it as a pandemic due to its furious and wide spread[2] as, so far, in (Feb 17, 2021) it has caused >109,217,366 confirmed cases and >2,413,912 deaths all over the world[3]. As well as, it has unprecedented effects on the global economy in all its sectors[1]. In the context of dealing with this pandemic and trying to contain it, the countries have concentrated its efforts on achieving two main goals: slowing the spread and increasing the preparedness of health systems to face the exacerbation of the crisis. Consequently, countries have taken many procedures to prevent the spread of this virus and limit its repercussions on all the global economy's sectors. Among these procedures are social distancing policies in order to limit the virus spread which include (lockdowns, travel restrictions and school closures), the effective use of personal protective equipment, testing and tracking and increasing the health care capacity in order to avoid catastrophic outcomes for national health systems and reduce lives lost. All these procedures have drastic impacts on global markets[1, 4] because of the disturbances in the global supply chains of many productive sectors, that the entire global economic growth depends mainly on their continuity as well as, the delay in investments and drop in consumption[5].

Hence, the pandemic has impacted the way people live, work, learn and play, as well as changed the way enterprises and consumers behave and cause increase in online activities such as shopping, meeting and learning.

As, enterprises realize that they can operate remotely whether at the same or even higher levels of productivity and cost efficiency thus they turn to ramp up digital solutions, leverage third-party platforms and use social media to communicate constantly with their customers. Which in turn created ICT-based opportunities for enterprises in various industries such as telemedicine, E-learning, automated safety, sanitation and etc.[6, 7].

The Middle East, like the rest of the world, has been affected by the COVID-19 pandemic[8]. Therefore, governments and telcos in the region have undertaken several initiatives in response to the market changes as technology and telecommunication services have become significantly crucial than ever before[5].

Study purpose: This study was conducted with the aim of reviewing the impact of COVID-19 pandemic on Information Technology industry in a comparative study between the top digital countries in Middle East (Saudi Arabia and United Arab Emirate) and Egypt. Through reviewing the changes in Information Technology sector and its use in various fields to counter the pandemic in Middle East then focus on the two targeted countries then reviewing the status of the field in Egypt. This study consists of four parts; the first one highlights the impact of COVID-19 on information technology industry globally. While the second part demonstrates the status of Information Technology industry in Middle East amid COVID-19. Finally, the fourth part presents the discussion and conclusion.

MATERIALS AND METHODS

This study aims to present a comparative study between Middle East top digital countries and Egypt in terms of COVID-19 impact on Information Technology sector and its uses to overcome the pandemic influences on the economic sectors. So, the required information was collected from various researches, reports and websites in order to synthesize a comprehensive approach of the status of Information Technology industry in Egypt among the Middle East countries.

Information technology industry amid COVID-19 pandemic: In light of the current COVID-19 pandemic, humanitarian needs must be adopted to the characteristics of this new crisis[9], especially after the compulsory isolation the governments imposed on their inhabitants which led to restricting the worker's movement and obstructing the traditional methods of work and production. As well as restricting the movement of consumers and limiting their ability to access markets. Hence, the need for radical transformation of business models[10], changing work methods and changing methods of product delivering to consumer were appeared. These conditions caused drastic changes in many industries; the major among them is Information Technology (IT) industry[11].

The impact of COVID-19 pandemic on the information technology industry seems to be less severe than on other industries[12] as well it is the strongest digitization push in history and Information Technology sector is likely to see a leap in the volume of its activities[11]. As according to Twilio report COVID-19 pandemic has accelerated the digital strategy of companies by an average of 6 years and 97% of decision makers say that the pandemic has sped up the digital transformation of their companies[13]. Therefore, governments and private sector are forced to steer towards a digital economy and digital-driven use cases are emerged in various sectors, such as; smart office/campus, remote healthcare, E-commerce, remote education, home automation, digitized public services and AI surveillance, etc. Consequently, the adoption of digital by both consumers and businesses is sped up due to this pandemic as a result of tending to E-commerce, remote working, distance learning, online gaming and telemedicine, etc. which in turn lead information technology sector to achieve gains during the crisis. On the other hand, however, the crisis benefits for information technology sector it also had negative effects on it[6] as shown in Table 1.

Information technology industry in the Middle East amid COVID-19 pandemic: Middle East countries are promoting digital transformation in every part of their

Table 1: The positive and negative impacts of the COVID-19 pandemic on the information technology industry

Positive impacts	Negative impacts
The demand for information technology increased as a result of relying on technological applications in learning, holding meetings and working remotely, including; Ding Talk, WeChat Work, Tencent Meeting and Zoom as well as purchasing products and completing financial and banking transactions via. the internet[14]	Devices witnessed a decline due to the disruption in supply chains and the tendency of many companies to close or work remotely which resulted in a great loss of opportunities for many companies, especially those with international customers[16]
The tendency of some sectors to increase their investments in technology in the short and long term, including the telecommunications sector, education sector, public sector and health care sector[15]	Many technology conferences were canceled, meaning that many companies lost a great partnership opportunity to expand[11], for example The (WWDC) conference held by Apple-the industry leader to connect millions of software developers was postponed from May to June, 2020[2]. So, it was estimated to loss of one billion dollars due to the cancellation and postponement of conferences[11]

Table 1: Continue

| Positive impacts	Negative impacts
Companies producing programs and technology for remote working and distance learning achieved exceptional gains as a result of the large and unprecedented increase in demand for these programs. The prices of these companie's shares on the global stock exchanges increased. Such as the American company (Zoom Video Communication's), that produced the (ZOOM) program which is used in conducting teleconferences. The number of ZOOM program subscribers on April 25, 2020 reached 300 million which exceeded the number of new subscriptions in 2019[14]. This led to rise the company's share on the Nasdaq Stock Exchange from about $ 70 at the beginning of 2020 to $ 156.40 on May 8, 2020 with an increase of 123.4%, and reached in Feb 17, 2021 $ 417.91 with an increase of 497 % over the beginning of 2020. As a result of these progress, the value of the company jumped by about $ 59 billion[18]. As well as there are 183,000 users in 175 countries using the Microsoft Teams tool for online education, and Microsoft achieved 2.7 billion meeting minutes in one day in April, representing a 200% increase from 900 million in March[19]	According to the Global Data report, the communications and information technology sector has witnessed a decline, whereas IT services have been the most affected as well as some software industry products decreased[17]
The demand for electronic entertainment platforms increased during COVID-19. The value of Netflix share increased from $ 295.84 in March 16, 2020 to $ 549 in Feb 17, 2021, with an increase of about $ 253.16 per share, by 85.5%. The "Facebook" company also announced an unprecedented increase in demand for messaging and video calling services and YouTube also, made great profits during this period[14]. As well as the global video game industry is thriving as the data shows huge growth in playing time and sales since lockdowns began and it was expected that the global video game market revenues will achieve $159 billion in 2020[20]	The growth rate of investing in information technology industry has decline due to the pandemic as software industry achieved a growth rate of 1.7% in April, 2020 instead of 7% in March, 2020[21]
E-commerce and E-retailing had witnessed a boom due to the demand increasing as a threefold increase occurred in revenues and customer numbers in 2020 and the volume of E-commerce reached $ 4.2 trillion dollars[22]. Thus, the shares of electronic retail trade companies achieved a big rise in the global stock exchanges. The American company Amazon is considered the most important among them as its shares rose from $ 1,676 in March 12 to $ 3,336.02 in Feb 17, 2021 with increasing of $ 1660.02 per share, representing 99%	The employment slowdown resulting from the crisis affects the future flow of skilled workers, so, technology support may struggle to keep pace with the growing customer needs of applications[23]
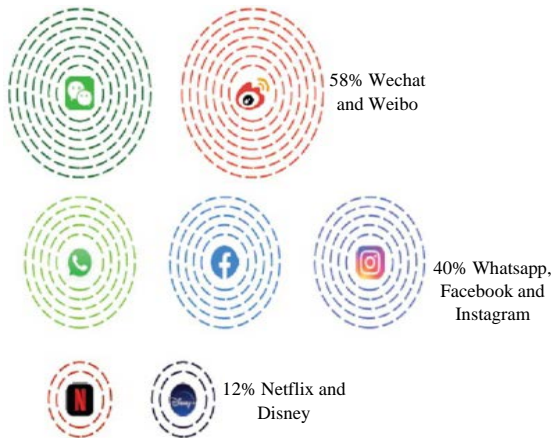
Fig. 1: Increase of traffic volumes across OTT players Feb & Mar 2020[24]

infrastructures as well as put plans and visions for broadband, AI and 5G[25]. COVID-19 pandemic has increased the internet and smartphone penetration in the Middle East which in turn increase social media to reach the majority of residents and increase the usage of internet-based-facilities. Thus, the overall traffic volumes of the Over-the-Top players (OTTP) in the Middle East increased in the first quarter of 2020 as Fig. 1 shows that Wechat and Weibo increased by 58% while Whatsapp, Facebook and Instagram increased by 40% and Netflix and Disney+increased by 12%[24, 26]. The pandemic also creates an increasing demand on information technology which encourage most companies in the Middle East region to shift to invest in cloud-based solutions and collaboration tools, like; Microsoft Teams, to be able to cope with the need for remote working. Consequently, the overall spending in ICT sector in the Middle East, Turkey
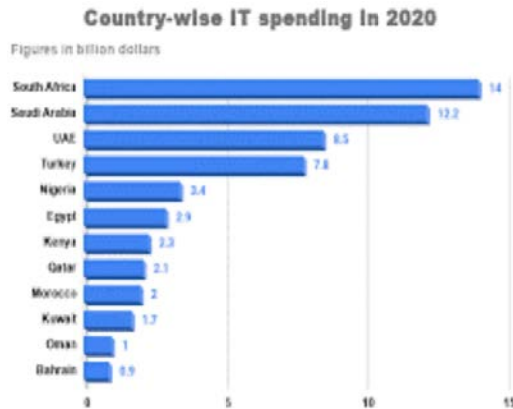
Fig. 2: The Top 12 countries in META Region Spending on IT[27]

and Africa region was expected to grow in 2020 by 2.3% reaching \$212 billion and regarding Information Technology (IT) space it grew by 1.3% achieving \$80 billion in 2020 compared to \$79 billion in 2019[27].

Moreover, there are some categories achieving growth and others fall. The categories that achieving growth including fixed data and mobile data grew by 6.3 and 9.1% compared to 0.7 and 4% in 2019, respectively, as well as IT infrastructure (servers, storage and networks), IT services and software grew by 2.7, 6.3 and 6% compared to 0.8, 3.2 and 1.5%, respectively. However, the categories that achieve negative growth including; mobile phones fall by 2.2%, PCs and tablets by 3.1% and IT peripherals by 4.5%, compared to 9, 3.5% and 4.1 in 2019, respectively[6, 27].

Regarding, Middle East region, the top three countries spending on IT are Saudi Arabia, UAE and Egypt, respectively. They are the fastest-growing markets in the region as shown in Fig. 2[27].

Therefore, the Middle East countries achieved advancing in the ranking of digital indexes in 2020 as follows:

Network Readiness Index (NRI): The top three countries in the region are: UAE ranked (3) and positioned the first in the region, Qatar ranked (38) and positioned the second in the region and Saudi Arabia positioned third in the region and ranked (41). While Egypt ranked (84) and come after the countries of Gulf Cooperation Council (GCC) in the region[28].

Digital riser report: Saudi Arabia ranked as the top digital riser in the region and Egypt ranked as the second, while, UAE ranked as the fourth as shown in Fig. 3[29].

Global connectivity index: UAE ranked (21) among (79) countries with (62) score and the first in Middle East

region and Saudi Arabia ranked (33) with (53) score and the second in Middle East. While Egypt ranked (64) with (36) score and the sixth in the Middle East after UAE, Saudi Arabia, Bahrain, Oman, Kuwait, respectively. UAE, Saudi Arabia, Bahrain and Oman achieved growth in 2020 than 2019 while Kuwait and Egypt fall back in the ranking compared to 2019[26].

According to the previous review in the fallowing the author will focus on reviewing the impact of COVID-19 on information technology industry in Saudi Arabia, UAE and Egypt as the top digital countries in the Middle East.

Saudi Arabia: Saudi Arabia has invested heavily in digital infrastructure to enhance shifting towards digital transactions, consumption and services. Its investments in the digital infrastructure exceeded SAR 55 billion which resulted in an increase in the average of internet speed and put the country at the first in 5G speeds and among the top ten countries in mobile internet speed with more than 6,500 towers installed in 30 cities as of May 2020[30]. It also threefold the number of Fiber-to-the-Home (FTTH) from one million homes to 3.5 million homes. These enable the country to continue working for more than 94% of both government and private agencies during the pandemic period as the digital maturity rate for e-government services reached 71%[31].

The number of Internet users reached 33.58 million out of the total population 35.08 million with 95.7% usage rate in the beginning of 2021 achieving an increase of 4.2% over the beginning of 2020. In addition, the number of mobile connections reached 39.53 million, representing 112.7% of the total population and decreased by (-1.2%) from the beginning of 2020. While, the number of social media users reached 27.80 million representing 79.3% of the total population and increased by 8% over the beginning of 2020[32].

Furthermore, the government has funded initiatives working with IT companies and telcos to accelerate segments such as data analytics, IoT, AR/VR, autonomous vehicles and smart homes[26].

United Arab Emirates: The number of Internet users in UAE reached 9.84 million out of the total population 9.94 million with 99% usage rate, achieving an increase by 1.6% over the beginning of 2020. In addition, the number of mobile connections reached 17.06 million, representing 171.6% of the total population and decreased by (-7.5%) from the beginning of 2020. While, the number of social media users reached 9.84 million representing 99% of the total population and remained unchanged from the beginning of 2020.

Egypt: Egypt is one of the pioneering countries in the MENA region that digitally transform its economy to enhance the Egyptian society day-to-day lives, modernize
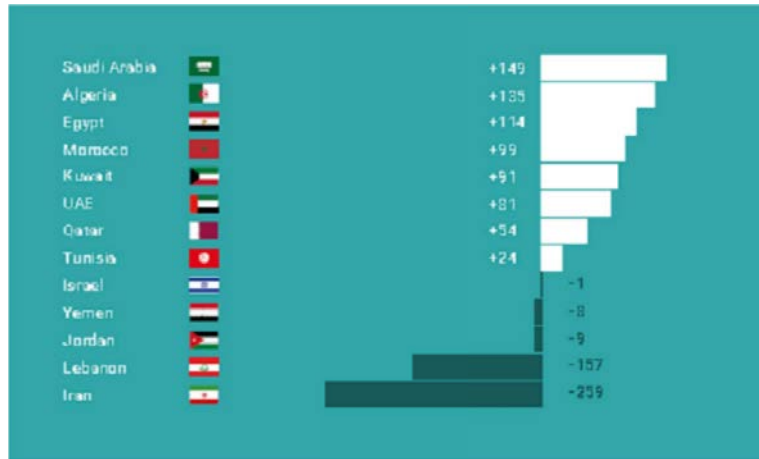
Fig. 3: Digital Riser in MENA Region[29]

its economy, enable new business models creation and accelerate development[33]. As, the industry of Information and Communication Technology in Egypt is one of the most prominent sectors that the government has been investing heavily in throughout the last period to achieve its digital transformation goals and the sector's share of investment in the information and communication technology sector achieved 5.44% in 2019[16]. According to the ICT 2030 strategy the Egyptian government tend to launch new initiatives that focus on capacity building, electronics design and manufacturing and technology parks as well as it including plans to digitally transform the core services in areas such as education, healthcare and government services[34]. Moreover, due to the State's efforts towards financial inclusion, the GDP of ICT sector achieved the highest sectoral growth rate in 2020 as it achieved EGP 108 billion by 15.2% growth rate and contributes by 4.4% to the real GDP[16].

COVID-19 outbreak has increased the demand on Information Technology (IT) as the internet penetration achieved 57.3% in January 2021 achieving an increase of 8.1% over the beginning of 2020. In addition, the mobile internet users raised from 39-50.48 million with 32.26% annual change rate rather than 11% in 2019 and mobile internet usage has increased by 35%[35]. Moreover, the number of peak hours for internet usage has increased from 7 h per day to 15 h per day, the load has increased by 99% and the international calls increased by 19%. Also, some online solutions and applications witnessed a significant increase in usage like: Zoom app increased by 3465%, Telegram increased by 1100% and YouTube increased by 115%[36].

This progress catalyzes the growth of this sector and accelerate the Egypt's digital transformation plan, as it enhanced the technology innovation and encourage innovative solutions to counter the pandemic, consequently, new startups are established with an unprecedented success rate[37]. Therefore, the investment in the ICT sector achieved EGP 48.1 billion in 2020 compared to EGP 35.4 billion in 2019 with 35% growth rate and the number of information technology companies in 2020 achieved 1336 compared to 1199 in 2019. Furthermore, the exports of information technology services achieved $ 4.1 billion with 13% growth rate over 2019[30].

As well as, the ministry seeks to improve the ICT infrastructure and increased the fixed internet speed in Egypt to around 35 Mbps at the end of 2020 compared to 6 Mbps in 2019, however, it was planned to reach 20 Mbps. This led Egypt to rise from the 40th position to the fourth among Africa. While, mobile internet speed recorded 20.42 Mbps in the end of 2020 which positioned Egypt at 102 out of 139 countries worldwide[35, 38].

The contribution of Information Technology in other economic fields in Middle East amid COVID-19: In order to impede the COVID-19 spread, countries in the region step up their use of artificial intelligence tools and enact polices that enhance the IT usage to facilitate remote working and distance learning[39, 40]. In this context and from the responsibility of Governments in Middle East to cope with the pandemic and remain businesses, they accelerate the adoption of E-government systems as follows:

Saudi Arabia government provides 944 online services in several fields such as; Business management, education and training, housing and municipal utilities, working and employing and healthcare services.

In UAE the Ministry of Community Development (MOCD) has committed to ensure the flexibility and continuity of all government services, so, it provide the services through its website in addition to smart applications and started using blockchain for the official certificates and other documents digital authentication[41].
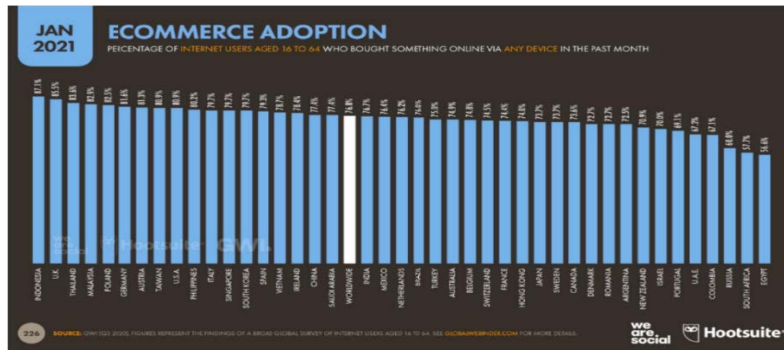
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Fig. 4: E-commerce Adoption in 2020

Egypt appears to have a slight advantage in the level of Information and Communication Technology (ICT) usage and skills among its citizens, especially in the government's support of emerging technologies and research and development (R&D) activities[42]. In 20 July 2020, the trail running of Digital Egypt platform was launched with 34 E-government services including notarial services, courts, driving licenses, vehicle licenses and catering services[29].

Moreover, due to the current precautionary measures, the digital adoption increased in all sectors including, e-commerce, healthcare, distance learning, remote working and etc. In the following is a review for many IT tools that ensure the work continuity in several fields:

E-commerce: E-commerce has witnessed a sudden surge in 2020 due to the impact of COVID-19 which represent a significant growth opportunity for this field in the Middle East region as 90% of shoppers in the region shop online[43]. In addition, according to checkout.com report, it was expected that nearly half of consumers are likely to increase their online shopping over the year 2021[42] as 49% of consumers in Gulf Cooperation Council (GCC), 48% in Jordan and 47% in Egypt saying they will shop online more frequently[43].

Saudi Arabia, Israel, United Arab Emirates and Egypt are the highest E-commerce markets in the Middle East as shown in Fig. 4[44]. While by Q1 2020 45 companies offered E-grocery across the GCC region and the total number of E-commerce websites reached >150, tripled from about 45, since, 2015[45]. The E-commerce market in Saudi Arabia has reached SAR 33 billion ($8.80 billion) and the number of E-retails has increased by 12.45%, reaching 28,676 E-commerce platforms at the end of Q1 2020.

As well as, the E-commerce market in UAE reached $ 7.40 billion with 18% annual growth. While according to the latest statistics that Egypt's Ministry of Supply and Internal Trade released in December 2020, E-commerce market in Egypt has reached EGP 40 billion which approximately equal ($ 2.56 billion)[46].

Consequently, online shopping is experiencing a great growth as in Q1 of 2020 Amazon's sales in the Middle East grew by 26% to achieve $76 billion. Mumzworld also achieved a growth of 800%[45]. In addition, the E-commerce sales of Bin Dawood Holding-Saudi retailer-had increased by 200% on a 10-day at the beginning of the pandemic while UAE's Majid Al Futtaim and Carrefour has grown by 59% in March 2020[47]. Similarly, meal prep companies and local delivery Apps have witnessed increase in orders and App. downloads such as; Talabat, UberEats, Instashop.

Fintech: COVID-19 has accelerated the acceptance of digital payments in the Middle East consequently; the digital payments transactions have witnessed a sudden surge in 2020. According to checkout.com report, >40% of online shoppers in the region are buying and paying online because of the pandemic[43] and 62% of those who shop online at least once a month, usually pay by card or digital wallet[44]. In addition, half of consumers are likely to increase their use of digital payments rather than cash or bank transfers over the year 2021[42].

The top three countries in the region in mobile payments are Iran, UAE and Saudi Arabia, respectively Fig. 5[48] with preference to pay through Google Pay and Apple Pay as well as Mada, QPay, BenefitPay and Fawry[44].

Furthermore, the pandemic-related restrictions represent an opportunity for banks across MENA region to improve and expand the depth and reach of their traditional and emerging electronic services as many banks offer fully digitized banking services for both customers and employees those carry out their jobs from home[48].

Egypt launched Know your customer system solution (e-KYC) in January 2020 to let customers open bank accounts electronically without visiting a bank branch or agent location. That is useful in addressing the challenges of social distancing and lockdowns[49]. Furthermore, as part of responsibility to COVID-19, The Central Bank of

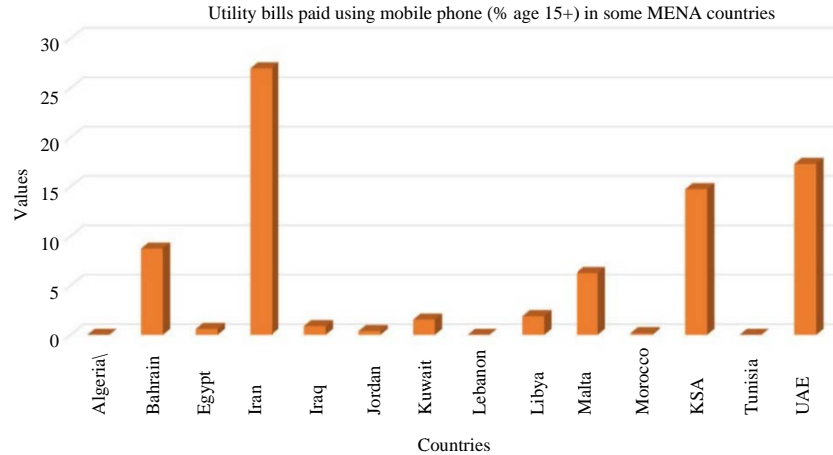Utility bills paid using mobile phone (% age 15+) in some MENA countries

Fig. 5: Mobile payments in MENA by country[48]

Egypt aimed to broaden the use cases for mobile money and increase the convenience of digital payment instruments, particularly cards and mobile-enabled financial services. Therefore, it raised the limits of digital payment transactions via mobile in March 2020, to $1,911 (EGP 30,000) per day and $6,370 (EGP 100,000) per month for individuals and $2,548 (EGP 40,000) per day and $12,740 (EGP 200,000) per week for corporations[50]. Additionally, the E-wallets number increased by 17%, from 12.3 million in March 2020, to 14.4 million in October 2020. Conducting 9.9 million E-transactions per month by October 2020 which increased by 156% compared to 3.9 million E-transactions per month in March 2020.

Healthcare sector: In the past decade Information and communication technology has played a significant role in the health sector[51, 52] whereas medical information and services can be provided via telecommunication technologies ranging from telephone to robotics[53]. Countries in the Middle East-particularly the GCC region-are making progress in adopting relevant information technology innovations in the health sector[54]. Furthermore, recently, COVID-19 pandemic has boosted more confidence in technology and tele-healthcare which accelerated the adoption of information technology exponentially in this crucial sector to ensure the highest levels of patient safety, thus, the demand for tele-health services and solutions, like smart hardware devices for E-health monitoring and E-consultation has skyrocketed[6].

Hence, Middle East countries seeking to enhance the tele-health services and solutions in their health sector to ensure the social distance and contain the crises. So, there are many digital health projects are launched in the Middle East-particularly GCC region-for this purpose such as the first E-hospital in the region (Mulk E-hospital

in UAE) being set up[6]. As well as, IoT applications for remote patient monitoring have been rolled out in many Middle East countries. In this context there are several Apps to trace COVID-19 cases through tracing individuals who came into close contact with people later diagnosed with COVID-19[55] such as, Trace COVID App in UAE, Tabaud app in Saudi Arabia, BeAware App. in Bahrain and Aman App in Jordan[39, 40].

Additionally, in UAE, Nabta Health platform use AI to provide risk and symptom assessments for COVID-19[39, 40].

Moreover, Saudi Arabia Ministry of health has introduced several Apps to enhance telemedicine usage such as: Mawid which guides users on self-isolation and arrange the hospital visits, also Sehha app that enables E-consultation for Saudis as well as, Tetamman and Tawakkalna Apps. to follow up the user's health status[39, 56].

In addition, Altibbi digital health platform in Arabic countries that considered one of the biggest digital health platforms in the Middle East, providing tele-health services and video consultations in addition to medical information. As well as Vezeeta App. that serves 4 million patients across six countries: Egypt, Saudi Arabia, Kenya, Nigeria, Jordan and Lebanon, allowing users to obtain tele-consultations, book doctors' home visits, book online appointments, online delivery and ordering of medications. The App. provides its services through video calls and phone calls[55].

Although, COVID-19, has further accelerated the digital transformation in Egypt through enabling applications, devices and developing the IT infrastructure[57]. In addition, Egypt is investing in health technology to provide efficient care to its people and reduce costs. The healthcare sector ability to utilize Information technology in containing the disease as well as identifying and diagnosing cases, is still weak due to

the absence of a system cutting-edge technology and consequently lack of data analytics. Whereas, the sector only utilize information technology through the awareness campaigns of the virus dangers and ways to prevent it[16].

Distance learning: COVID-19 pandemic has immense influence on the academic institutions in the Middle East[58] as it impeded the progress of education through imposing interim closure for the educational institutions. Accordingly, educational institutions are prompted to rapidly move to online teaching for classes at all levels as an emergency response to COVID-19[59]. This requires educators to convert curriculums to an online environment through the digital tools and educational Web sites[60].

Schools in Middle East countries like all worldwide are operating with a lower capacity and alternating between home-based learning and classes in school. Consequently, the demand for IT solutions to adopt distance learning increased as Business-to-Business (B2B) solutions enable K-12 schools to run operations remotely, broadcast lessons and conduct student assessments online. As well as Business-to-Customer (B2C) solutions enable to provide tutoring and professional training courses via Internet. In addition, the traffic on the education platforms during the pandemic increased and this sector is estimated to represent approximately $1.2 billion market opportunity by 2024 while telcos could potentially achieve $300 million of this market by 2024[6]. Consequently, many distance education channels and platforms are launched in the Middle East to counter the negative impacts of COVID-19 on the education sector such as Zedny platform for education was launched in mid-June 2020, to offer Arabic online courses. Following are some examples on the E-education tools in Middle East countries during the pandemic.

In Tunisia, the traffic on the Virtual University of Tunis increased by approximately 110,000 students have already signed onto its platform to take classes.

Regarding to UAE, in light of the COVID-19 pandemic 83% of the student population has opted to learning remotely and a number of 1,025 schools representing 82.86% of the total schools in UAE has deployed the distance learning system[60]. Whereas, Government schools implement a home-teaching program that called 'Learn from Afar' while private schools use the digital platforms such as MsTeams, Google Classroom, Zoom, Class Dojo and Seesaw. Moreover, the UAE's Ministry of Education provide several online resources to support remote learning and assessment for both students and teachers[61]. As well as, the Knowledge and Human Development Authority in Dubai and the Department of Education and Knowledge in Abu Dhabi launched specialized portals; In This Together Dubai and Activity Platform. Furthermore, Lamsa World education platform has witnessing an unprecedented shift toward online learning since the closure of schools. As the downloads and content consumption on the platform increased by at least 300%.

Saudi Arabia also has launched a comprehensive educational system embracing various electronic education tools. Includes for basic education, 20 television channels, channel on the YouTube platform, the national education portal (Ien) and "Madrasati" platform. While regarding to Saudi Arabia universities, 27 university provide two million online class that achieved unprecedented traffic with over 1.2 million users attended about 107,000 learning hours in >7,600 virtual classes[62].

In Egypt, the online learning has grown after the virus outbreak by 45%[16]. Egypt's government is keen on creating solutions and promote E-learning to develop a robust and sustainable educational system that able to endure future crises. Consequently, the Egyptian Ministry of Education and Technical Education (MoETE) implemented distance learning and assessments through launching platforms and applications as follows[25, 63].

Launched the educational platform (Edmodo) to k-12 students to counter the school's suspend among the pandemic in March 19, 2020, as a number of 3000 interactive lessons were broadcast from the beginning of the pandemic.

Providing extended access to the Egyptian Knowledge Bank (EKB) to K-12 (kindergarten to secondary education) students through the link; https://study.ekb.eg. That providing content by grade level and subject in both Arabic and English in multiple forms; videos, images and documentary films as well as it is accessible by computer or phone and serve approximately 22 million students distributed over about 55,000 schools

Established the national project for physical fitness website (https://stud-sportact.emis.gov.eg/) to raise the efficiency of student's physical fitness. The number of participants on the site reached (28000) students.

Developed 89 interactive electronic educational software (Learning objects). Provide a new electronic application to parents to apply for their kids in the kindergarten stage.

Establish a comprehensive electronic system providing electronic services such as; collecting school fees through the electronic payment and automating general certificates. Launch an electronic system to receive and respond to the electronic services provided complaints (CRM System). As well as create a portal for parents and students to submit complaints. Launched an online platform in order to provide training courses for SMEs.

Remote working: Remote working become the new norm after the outbreak of COVID-19 pandemic, this recent shift towards remote working has radically changed the way most businesses in MENA operate as they forced to investing remote softwares and video conferencing, so, they can keep working efficiently. As, according to a survey conducted in June 2020 by Bayt.com, approximately three-quarters of professionals across the MENA region representing 74% prefer working remotely and 90% of the professionals in the region expect remote working to keep on increasing[64].

Furthermore, countries in Middle East enacted polices to facilitate remote working such as; UAE has lifted the ban on VoIP services and popular video conference Apps such as Microsoft Teams and Zoom. As well as, the country using sophisticated technology to ensure the resident's adherence to social distancing through speed cameras, drones and robots. Also, hypermarket chain uses AI to minimize delivery time[39, 40]. In addition, Dubai has launched a program to enable overseas professionals working remotely from their home countries[65].

In Saudi Arabia, remote working has become a major requirement for 45% of employees due to shutdowns and precautionary measures. Which caused a significant increase in demand for meeting facilities, especially platforms that provide direct video communication service and are associated with features such as task management and schedule, chatting, attendance tracking and screen sharing. Consequently, the demand for remote work platforms like; Dingtalk, Zoom and Skype increased during the closure periods in Saudi Arabia by 567%[66].

RESULTS AND DISCUSSION

COVID-19 pandemic has affected the information technology sector significantly as the demand on internet services and information technology has increased which accelerated the development and innovation to create new ideas to introduce information technology in various economic fields such as E-commerce, distance learning, remote working, healthcare, etc., helping them to overcome the COVID-19 negative impacts. These create a great opportunity to software companies that offer video-conferencing, educational platforms and remote-working applications to grow heavily.

CONCLUSION

Regarding to Middle East countries the pandemic revealed the tech resilience of the region. In addition, this study revealed that Saudi Arabia, United Arab Emirates and Egypt are the top countries spending on information technology and make great achievements in their digital transformation strategies due to the pandemic. It also clears that, however, the Egypt's achievements in developing its IT infrastructure and introducing information technology in other fields to be able to cope with the pandemic it still need more efforts to reach Saudi Arabia and UAE particularly in health sector, remote working and E-commerce. Nevertheless, Egypt is one of the pioneering countries in digital transformation in Middle East and witnessing a great leap in this sector during the pandemic.

RECOMMENDATIONS

Improves the information technology infrastructure and doubles investments in networks especially in rural areas, to enabled IT sector to meet the needs of other sectors especially education and health sectors. Improving the logistic infrastructures such as; electronic payment and shipping.

Adopting new technologies such as Blockchains and cloud computing to reduce transaction costs and provide the required information for analysis that benefits other sectors. Introduce information technology and artificial intelligence in healthcare sector and use big data in data analyzing to understand the mechanism of disease spread as well as identify hot spots, large gathering areas and violations of curfew decisions through heat maps.

Enacting restrict regulations for cybersecurity to encourage enterprises to adopt information technology systems in work and activate electronic signature law to facilitate remote working. Enacting regulations for E-payment transactions to enhance E-commerce.

Activating information technology in government entities by implementing the "Ticketing" system in hospitals and government departments such as real estate and others to avoid overcrowding. Investing in information technology and supporting the information technology companies. Establishing the necessary applications to serve the various sectors according to the new circumstances during the pandemic. Organizing awareness campaigns to increase the awareness of Egyptian people of information technology benefits and encourage them to expand their usage.

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