



# Mechanisms for Bridging the Digital Divide in International Experiences: Solutions to Enhance E-Governance in Egypt

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## Abstract

*The purpose of this paper is to investigate the role of mechanisms bridging the digital divide (DD) with the three dimensions technology, knowledge, and electronics, in order to improve e-governance. The paper focuses on e-services, transparency, participation, and accountability in international experiences, mainly concerning the achievement of the SDGs, to propose solutions for Egypt and other developing countries.*

*Design/methodology/approach- This study merges a comparative analysis methodology with a descriptive-analytical approach to compare four country studies: the UK as a developed country; China and India as developing countries; and UAE as an Arab country, according to determined study standards. The study uses secondary data sources from international reports, and theoretical literature, as well as preliminary data from digital strategies, and state documents published in each the country's e-portals.*

*Finding- This study examines similarities and differences in standards compliance in four countries, namely UK, China, India, and the UAE, indicating the role of a positive relationship between the mechanisms for bridging DD and the promotion of e-governance.*

*Originality/value- To the best of the authors' knowledge, this is one of the few studies that investigate the relationship between mechanisms of bridging DD, and enhancing e-governance on the international level. This study creates a crucial contribution as it demonstrates the significance of applying e-governance in governmental institutions in general, and particularly in Egypt as a leading model, being a critical country in Africa and the Middle East.*

**Keywords:** Mechanisms Bridging Digital Divide, E-governance, CyberSecurity, Egypt.

## Introduction

ICT has become critical to achieving sustainable development strategy goals (SDGs)

in economic and social dimensions, which have been adopted by world leaders in September 2015. In addition, the emergence of COVID-19 and economic crises has become digital transformation accelerators for the world. The significance of the research contains concrete evidence from the real world to highlight the positive link between the mechanisms of DD and expanded e-governance, which is an accelerator to SD.

This research aims to bridge DD - to enhance e-governance, which is important to achieve Vision 2030. So the study's aims are to analyze DD and examine its dimensions and mechanisms to bridge it and study the con-

\* This article was submitted in September 2022, and accepted for publishing in November 2022.

© Arab Administrative Development Organization- League of Arab States, 2025, pp 1-22. DOI: 10.21608/AJA.2022.162570.1321

cept of e-governance, its determinants, and benefits, as well as how it can be applied in successful international experiences for elaborating solutions for the application of e-governance within Vision 2030 for institutional transparency and efficiency of developing countries and particularly Egypt because this is an appropriate context to conduct this study by exploiting regulatory, reform, and policy issues within the research context or setting.

The Egyptian government plans to be among the world's top 30 countries regarding citizens' quality of life, spending rationalization, institutional efficiency, and transparency. The Egyptian government is shifting- digitalization in various sectors and ministries, and so aspires to adopt e-governance (Ministry of Planning and Economic Development 2018).

Egypt began the National Technological Renaissance Project, as one of the most notable achievements being a rise in the capacity of central offices and the number of internet clients. Among the key programs supporting the active transformation of public services for citizens in a digital society is the creation of a self-funded city of knowledge, administrative capital, and projects for professional cadre rehabilitation. Concerning Egypt, Sustainable Egypt has employed the participatory method for performance development in future agricultural initiatives. Because the SDGs are about governance, they require high-quality data and information, government officials' skills and resources, strategic performance, and monitoring and evaluation mechanisms including performance-based budgeting, impact assessments, and stakeholders engagement.

Based on a review of the literature, as a result of current changes such as the COVID-19 crisis and beyond, many governments throughout the world are implementing goals of the 2015 Sustainable Development (SD) Strategies (UN, 2015). This is evident in Egypt's execution of Vision 2030, particularly the emphasis on transparency and efficiency of government institutions. The Egyptian government plans to implement e-governance offering a clear vision for the digital transformation of the society, which cares the citizens' right to access effective and diverse government services anytime and anywhere, affirming the citizen participation, digital transparency, openness to information, financial inclusion, preserving the confidentiality and privacy of citizens, e-control, government accountability, and raising the awareness of the knowledge and e-skills of employee's government sectors, especially in the framework of services digitization in varied development projects. First of all, rural Egypt's modernization is decent life, which accounts for 57% of Egypt's total population (IDSC, 2021). However, Egypt faces challenges that hinder the application of e-governance, which the most important is DD at the local level in the use of ICT and internet access, the number of users in Cairo governorate reached 36%, while it was 15% in Upper Egypt (ICT indicators,2021). However, Egypt faces a DD at the local level between rural and urban areas.

According to the Egyptian Prime Minister's Office (2022), the emergence of new digital and knowledge skills such as robotics, Big data, and Blockchain, an emerging technology expected in the government sector, will bring about significant change in the health, real estate, insurance, and contract sectors, as well as improving information security and lower information costs, encouraging innovation in global trade.

A main shift in the labor market, is the transformation of employment into previously unattainable professions, and the reduction of many jobs as a result of digital revolution,

where the critical challenges facing Egypt in light of the digital transformation are inverted pyramid unemployment; geographical disparity of unemployment and wage imbalances as a result of the Egyptian Pound's floating; and the inconsistency of the legislative and institutional framework and its bias towards the government sector, where Egypt faces a lack of institutional coordination in the Egyptian labor market between the government, the private sector, and public business sector. However, Egypt's digitization initiatives include training 100,000 young people in web programming and big data through the top online education platform, Udacity; Egypt Digital Builders Initiative and Tomorrow Digital Initiative to Develop the Capabilities of Provincial Youth-Establishing Specialized Applied Technology Schools; Collaboration with

Microsoft for 1000 young people and Amazon for 500 young people capacity-building; Ain Shams University's program of Applied Professional (IDSC, Information Center Publication 2022).

Based on the above, the Egyptian context is a model appropriate for learning significant lessons. This study presents solutions for developing nations with similar economic and social challenges towards SD. Therefore, the study addresses the research question of how the DD can be bridged to promote e-governance within international practices and to find practical solutions to the situation in Egypt.

In this study, the descriptive and comparative analysis of the mechanisms aims to bridge DD to enhance e-governance application of various international experiences in four countries: the UK, China, India, and UAE to answer the research questions

Consequently, this study seeks to make the following contributions to existing literature:

First, specifying the most important mechanisms to bridge the digital 3D technological, cognitive, and e-divide which plays a key role in encouraging e-governance to develop economic and social protection, particularly in projects embraced by the state to achieve the quality of life. Secondly, the practical lessons acquired could be beneficial providing comprehensive solutions for effective e-governance to Egypt's context and other developing countries. Thirdly this will improve the government performance, and the citizen participation in decision-making, and increase citizens' trust in the government through e-participation in social media platforms. But the literature has focused on DD between the state's economic factors like income, cultural dimensions, social (equitable internet access distribution), geographical distribution, generational demographics, and gender.

So the study aims to fill the research gap in the studied literature by classifying integrated mechanisms of bridging the digital divide (technological, cognitive, electronic) that have an influential role in promoting four determinants of effective e-governance (e-service,-e-transparency, e-participation, e-accountability) in four countries that are different contexts as empirical case studies.

This Paper Is Structured As Follows: Theoretical Literature Review; Theoretical Framework; Research Methodology; Research Objectives; Research Questions; Research Hypothesis Reviewing Empirical Literature; Empirical Results And Discussion; Conclusion And Recommendations And Solutions To Egypt; Then The Future Research Agenda.

## Literature Review

This section is categorized as below:

### *Mechanisms of Bridge DD*

Singh (2012) argued primarily on DD between rural and urban India, where 75% of the population lives in rural areas, and divided DD into four levels: access divide, a capacity divide for usage, measured by complementary skills and assets such as innovation, actual usage divide, measured by trade and e-business levels, and impact divide, measured by economic and financial returns.

As a result, there is a DD in the usage of Information technology and Internet access between sectors, organizations, and companies. Tewathia et al. (2020) clarified the levels of illiteracy and education in India and English proficiency, noting that they affected the digital economy and digital inequality, and represented a digital skills divide even with available internet.

Techataweewan & Prasertsin (2018) claimed that digital transformation, internet influence, and technology management were new skills that support and equip students for careers in Thailand. They found that the digital competency requirements for university students were operational skills, management and

application, as well as software assessment, indicating that universities needed to address digital education, and assess students based on these skills.

Al Izki & Weir, 2014 highlighted the divide in digital communication, knowledge, and cybersecurity, which affected the performance of the digital economy in the Arab Gulf States. They recommended improving human resource training in cybersecurity to bridge the knowledge divide.

The current paper varies from prior studies in that it focuses on the mechanisms to bridge a DD with a 3D technical, cognitive, and e-integration from a contemporary perspective, relating to emerging technologies in developing nations with digital SDGs.

### ***E-governance***

This axis examines the literature on e-governance implementation.

Gupta et al. (2018) proposed a framework for the benefits of e-governance in India that included four dimensions: economic benefits, quality of service, quality of good governance, and personal development of citizens, indicating a difference in citizens' opinions and awareness of the governance benefits covered by the proposed framework based on age, gender, education, and income. The report advocated streamlining procedures and combating corruption because it is a challenge that Indians face.

Nevertheless, Olalekan and Ibietan (2017) used TAM (Technology Acceptance Model) to spotlight citizens' technical behaviour and usage of e-governance applications and public service delivery in Nigeria. Because implementation of e-governance involves the public in policymaking and enables enhanced delivery of public services, this model attempted to anticipate technology acceptance and identify improvements required to be acceptable to citizens.

The OECD (2017) examined innovations in public governance, where each nation was distinguished by increasing civic participation and provided successful models for government innovations in several emerging economies and Arab countries. The report's recommendations showed identity citizens or companies' access to e-services, banking services, and digital authentication, and foundations of digital commerce and social relations as elements of strategy to protect information systems and networks from e-identity theft and protect user privacy and security.

The UN report, (2018) identified performance indicators of e-governance, such as e-participation, as the process of involving citizens in decision-making, by ICT, designing service delivery, and making it participatory, inclusive, and deliberate are indicators of participation, transparency, and accountability, as well as information and its accessibility via the Internet. Performance indicators also include citizens' feedback on initiatives, the ease of suggestions, the availability of cybersecurity information on laws, rules, regulations, the activation of digital identity legislation, open government data on the Internet, and complaints.

This study utilizes this literature to enrich the proposed theoretical concept of e-governance and its limitations through different contexts in rural and urban communities, in addition to using models for some literature referenced in the application of e-governance to increase the citizens' trust in the government. Some studies suggest measuring the dimensions of e-governance, particularly the fight against financial and administrative corruption, through e-control and e-consultation.

### ***The Relation Between E-Governance And Digital Divide***

Studies by Mutula (2005) and Mphidi (2008) interpreting the digital divide in Africa agree that it is caused by poor use of ICT resources and some provinces under lack of access to electricity, widespread bureaucracy, and hence application of e-governance to build information society by connecting public libraries and government with the delivery of public services via the Internet and reducing communication costs.

According to the research by Stoicu (2011), the business sector and government were in partnership to create an information-based society. Yet there was a DD that represented an imbalance in internet access and income, and identified important elements in development of e-governance as specific factors in closing DD, such as national and regional cooperation, the adjustment the legal framework and regulation, and improvement of the quality of life in all aspects through access to knowledge.

In previous studies were limited to emphasize that e-governance application closed the digital divide. But in practice, the application of e-governance in an environment with a lack of technological and intellectual resources differs in developing nations. As a result, the present study differs from others because it highlights the importance of mechanisms for bridging DDs, in order to enhance e-governance in light of the 2030 SDGs.

In general, this study complements previous studies in the theory and practice of digital public administration, and contributes to the literature by providing a comprehensive understanding of the role of DD bridge mechanisms in technology-knowledge-electronics in enhancing e-governance, with a focus on e-services, e-participation, transparency, and e-accountability.

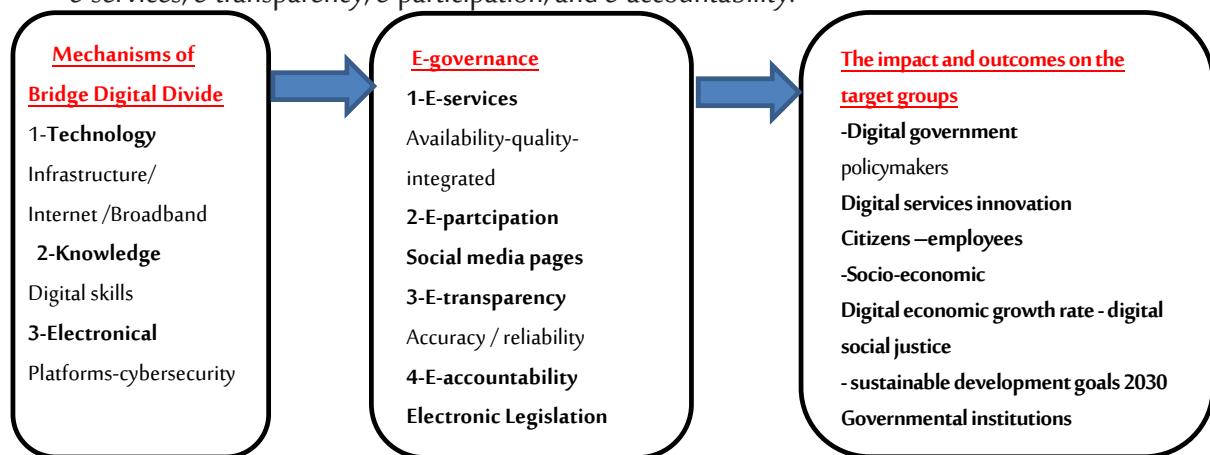
### Theoretical Framework

This section contains theoretical analyses examine at the role of mechanisms bridging DD in improving e-governance. It investigates proposed theoretical framework presented in Fig. 1.

It discusses definitions, DD, and e-governance criteria as follows:

- 1- Concepts and definitions
- 2- Mechanisms of bridging DD and applying e-governance:

e-services, e-transparency, e-participation, and e-accountability.



Source: Prepared by the researchers

Figure .1 Relationship Between Mechanisms Bridging Digital Divide and E-Governance

### Concepts And Definitions DD

The concept of DD according to Dijk J.V. (2008) explained the universal access, or just access, to computers and the Internet, and pointed to the gap between those who can access new models of information technology, and those who cannot often have access to computers, networks, telephones, and digital equipment, regarding the distinction between developed countries, where Internet access is available to all individuals, businesses and governments, and developing countries where to access the internet is through

public facilities, such as libraries and technology centers. Furthermore, OECD (2001) defined DD as the difference between individuals, households, businesses, and geographic areas at different socioeconomic levels in relation to ICT and the use of the Internet for a variety of activities. In addition, DD is a social issue related to the disparity in the amount of information between those who have access to the Internet (especially broadband access) and those who do not.

According to the first definition, the digital divide is simply a mismatch in internet access caused by differences in the quality of physical and software equipment, resulting from a gap between developed and developing countries in new application models. While the second definition is more comprehensive, it explains the level of the digital divide, whether geographical or at the level of institutions and individuals, as well as another level of Internet quality, the most important of which is the difference in economic and social conditions. The current study focuses on the digital divide of three dimensions, **First:** technological (physical equipment in the first definition, and infrastructure as broadband, as in the second definition). **Second:** The second dimension is the cognitive aspect, which focuses on the skills of use for individuals where the term became popular among interested parties such as academics, policymakers, and stakeholders in the late 1990s (The Digital Divide, ICT, 2018). The later knowledge gap, as explained by the Flagship Initiative (2010), SEC (#1161), is a key feature of the knowledge economy, occurring at global and local scales, leading to inequalities in information quality that are assumed to be part of the innovation gap, particularly in the service design, use of social networks, and cloud platforms. Thus, when transferring technology developing countries lack the know-how to maintain technology, and need the support of the application, software, and operating system manufacturers because they only have a license to use, without the right to develop, leading to obsolescence of technology. Additionally, the financial loss of the drastic changes brought about by the transition to new systems has created a DD in these countries. **Third:** dimension is e-aspect, which is the gap between e-platforms and their contents and cybersecurity related to privacy and data confidentiality, which is evident in developing countries in general and Arabic countries in particular as previously reviewed literature from a study Al Izki & Weir, 2014 in Arab countries there is a lack of cybersecurities than in developed countries.

### ***E-governance:***

Suri (2017) defined governance as the exercise of political, economic, and administrative power in the management of a particular country's affairs, including expressing citizens' interests, accessing their rights, and performing their legal duties. Saxena (2005) defined e-governance as an information age model of governance that aims to achieve processes and structures to harness the potential of ICT at different levels of government, the public sector, and beyond to ensure and promote good governance. The foregoing shows the concept of new governance, as well as the institutional shift from national to international - from bureaucracy to markets and networks, implying a reduction in the role of central government, as confirmed by the definition by Khan (2017). The Private companies and NGO's governance without powers are new forms of government management through the use of communication technology.

Based on the above definitions, it is clear that e-governance is the management of state and community affairs through cyberspace. The concept's applications are in the form of programs and projects to increase the effectiveness of e-services and participation, and transparency for citizens to achieve accountability for online governments.

Hence, Irfan (2017) emphasizes the importance of adopting e-governance in the context of digital public administration due to its effective e-services for their responsiveness, improved transparency, accountability, reduced human intervention, automation of processes, e-service privacy, e-security, e-risk management, and potential in overcoming e-corruption.

Despite the advancement in e-governance after the new public administration, and the shift of governments to management by results the research activities in e-governance were still in the early stages,

and did not reach maturity. However a study by Bindu et al. (2019) showed four stages of transformation in e-governance models:

- 1- The year 2000: information system models
- 2- 2010: system evaluation, the transformation of government processes, and evaluation of citizens (as users)
- 3- 2016: the availability of online e-services, increased use of email and SMS, and affordable internet with e-participation.
- 4- After 2016: agile relationships with citizens.

All these phases show that the use of e-governance is no longer a dream but has become a future trend to expand e-democracy (e-voting), e-participation of citizens, and the use of social media to empower citizens.

Furthermore, Big Data is currently a new technology that focuses on the analysis and prediction of public policies, with analysis methods related to human background and individual knowledge development, and with the requirements for implementing e-governance based on the government environment or on the institutional level. The challenges and opportunities to reach the value chain, and raise awareness social equality and digital inclusion to improve the quality of life of all citizens are as follows. According to the results of a pilot study (Nandal & Singla, 2019), interactions between government, stakeholders, and citizens are crucial for the success of e-government. There is an opportunity for government to encourage e-participation wherever the government social media channels that become lobbyists, as done by US Presidents Barack Obama and Donald Trump in their historic election victories.

### **Relation between Mechanisms DD and E-Governance**

However, it is clear that mechanisms bridging the digital divide depend on an objective, rational and standardized methodology for applying e-governance accordingly, the determination of related four pillars (services-transparency-participation-accountability).

Consequently, according to Chaundahr (2017), challenges that e-governance has to face include environmental and sociological considerations (language, illiteracy), the spread of illiteracy, English weakness and multilingualism in countries like India, with implications on ICT-related processes, such as the gap between rural and urban areas, lack of integrated services, and partnership between government and stakeholders. As agreed by Marsh & McLennan (2020), institutions operate in complicated ecosystems with cyber threats, a lack of digital skills, insufficient collaboration between stakeholders, incompatibility between global cybersecurity frameworks, in addition to the ability of struggling institutions to adapt to new technologies and increase their financial burden. This is consistent with the studies by Garg (2016) and Taherdoost (2018). The main model of e-governance is its emphasis on the characteristics and protection of e-services, which are crucial attributes for citizen satisfaction, although privacy and security are issues that need to be explored.

Based on the previous review of the literature and the theoretical framework, the authors confirm the significance of the study by investigating the extent to which there is a positive correlation between the mechanisms of bridging the digital divide and enhancing e-governance as follows.

### **Research Methodology**

This research is based on a qualitative methodology using an analytical descriptive and comparative approach to analyze the theoretical relationship between mechanisms of bridging DD, and the enhancement of e-governance in addition this study present the evidence using empirical literature and hypotheses development, according to specific standards in the mechanism of bridging the digital divide 3D as an in-

dependent variable, besides the standards of e-governance (e-services, e-transparency-participation, and e-accountability) as a dependent variable in the context of the four studied countries: the UK as a developed country; China and India as developing countries; and UAE as an Arab country. It is necessary to consider contextual elements such as the socioeconomic of the four countries.

## Data Sources

Comprehensive review of the theoretical literature review using Secondary data in articles, periodicals, international reports, digital strategies, and executive documents.

The methodology of case studies as international experiments depend on real data of the four countries which were studied as causal arguments driven by theories to investigate the relationship between the study's variables to deduce practical lessons and solutions for other developing countries seeking to implement e-governance, such as Egypt as a model, because it is an African, Arab, and Middle Eastern country.

## Objectives of the Study

This research aims to bridge the digital divide to enhance e-governance that is important for sustainable development to achieve vision 2030

- Analyze the digital divide and examine its dimensions and mechanisms to bridge it.
- Study the concept of e-governance and its determinants, its benefits and how it can be applied in successful international experiences.
- Elaboration of solutions for the application of e-governance within the Egypt vision 2030 for institutional transparency and efficiency.

## Questions of the Study

- What are the mechanisms to bridge DD (technological, knowledge-based, and electronic) in the context of digital transformation in international experiences?
- How do mechanisms to bridge DD help in the implementation of e-governance to achieve e-service effectiveness, information transparency, e-participation, and e-accountability?
- What lessons can be learned from international experience in bridging DD to apply e-governance in Egypt and other countries facing the same social and economic conditions?

## Hypothesis

The formulation of the relationships between variables of the study can be deduced from the previous literature review and theoretical framework according to the research variables: The major hypothesis is a correlation between mechanisms for bridging the digital divide in governmental institutions and promoting e-governance.

So we conclude the scientific basis for each hypothesis, we look at the development of the research hypothesis into three groups:

- 1- **H1.The first group of assignments addresses the relationship between mechanisms to bridge the technological gap and promote e-governance**
  - H.1.a There is a positive correlation between the mechanisms of bridging the technological divide and the effectiveness of e-services.
  - H.1.b There is a positive correlation between mechanisms of bridging the technological divide and e-participation.



- H.1.c There is a positive correlation between mechanisms of bridging the technological divide and e-transparency.
- H.1.d There is a positive correlation between mechanisms to bridge the technological divide and promoting e- accountability.

***H.2 The second group addresses the relationship between the mechanisms of bridging the knowledge divide and strengthening e-governance***

- H.2.a -There is a positive correlation between the mechanisms of bridging the knowledge divide and the effectiveness of e-services.
- H.2.b There is a positive correlation between mechanisms to bridge the knowledge divide and promoting e-participation.
- H.2.c There is a positive correlation between the mechanisms of bridging the knowledge divide and promoting e-transparency.
- H.2.d There is a positive correlation between mechanisms to bridge the knowledge divide and promoting e-accountability.

***H.3 The third group addressed the relationship between bridging the e-divide and strengthening e-governance.***

- H.3.a. There is a positive correlation between the mechanisms of bridging the e-divide and the effectiveness e- services.
- H.3.b There is a positive correlation between mechanisms of bridging e-divide and promoting e-participation.
- H.3.c There is a positive correlation between electronic divide bridging mechanisms and e- transparency.
- H.3.d There is a positive correlation between mechanisms of bridging the e-divide and promoting e-accountability.

As follows, researchers attempt to prove these hypotheses through reviewing empirical literature to obtain matter-of-fact evidence confirming these hypotheses' validity or not .

## **Reviewing Empirical Literature**

This Section provides empirical, comparative analysis of the experiences of the United Kingdom, China, India, and the United Arab Emirates, in order to investigate the relationship between the mechanisms that bridge DD in its various dimensions (technology, knowledge, and electronic) and e-governance standards (efficiency of e-services, e-participation, e-transparency, and e-accountability) and the impact on the government sector in order to answer research questions.

## **United Kingdom Experience**

In 2017, the British government published a digital strategy to promote the world's leading digital sectors.

- 1- Technological mechanisms to bridge DD for investment in infrastructure and digital connectivity. For broadband in more than 90% of UK buildings, the government has launched broadband deployment UK BDUK project for high-speed internet (Ipsos, 2018), fixed and mobile broadband use rural satellites (Chiha and Van, 2019), and Smartphones and networks, allocating financial support from the National Investment Fund to the digital infrastructure development, improving spectrum use for connectivity and innovation in 5G technologies (Broadband. Co.Uk, 2021).

- 2- Mechanisms to bridge the digital knowledge divide: The UK government has invested in fundamental digital skills, such as information management, web use, social media, financial and banking transactions, and digital services, as well as in the collaboration between technology organizations and governments to build a global digital state to become an innovation leader (Tinder Foundation and GO ON UK, 2015).
- 3- Mechanisms to bridge the e-DD: Improved regulations related to cyber threats increase the coherence and effectiveness of the UK cyber confrontation, and enhance data protection legislation (National Cyber Security Strategy, 2016-2021).

### **E-Governance In The United Kingdom:**

The UK has economic incentives for adopting successful e-governance, and provides standards for obtaining an effective and direct digital service by using the Service Handbook (2021). The government has deployed digital technology professionals in all branches of government. Effective service applications are developing agile technology (agile government). Collaborating with expert partners, technology partners, and policymakers in data science (OECD, 2019) and digital innovation improves policy with emerging Blockchain technologies, and creates appropriate ecosystem works (Abodei et al., 2019). Issuing AI and privacy guidelines (OECD AI Principals, 2021) mitigates risk and ensures compliance with UK data protection law. The regulations address accountability and governance in AI fair, lawful, and transparent data security, balanced with the rights of individual data.

### **E-Governance In UK's Sectors**

- Healthcare sector, implementing sectoral information transparency initiatives, investing in research to create effective systems, better care, and lower costs, and partnership between the healthcare sector and technology companies to make healthcare services smarter (Waytt et al., 2020).
- **Tax sector**, digital tax program to shift digital income and tax habits, special tax breaks for employers and banks, integrated information delivery, and the imposition of a digital service tax (digital service tax, 2018).
- **Education sector**: Education is the fastest-growing in the UK, accounting for 4% of all digital sectors during the COVID-19 pandemic. Inter-sector interoperability has helped reduce administrative burdens. The fixed and wireless broadband networks has accelerated online learning OECD (2020).

E-Participation is critical to public participation in the context of access, permissions, and e-services. The UK has adapted it to align with the Digital Identity Strategy, regulatory regimes, and privacy to meet the needs of the defining individuals to use their digital identities. Digital Government (2021) creates a safe national identity to build trust and transparency. The UK ranked first in the 2018 CyberSecurity Index, and managed cyber risks by implementing a strategy compatible with e-governance technologies (Kapalidis et al., 2019).

### **China Experience**

**Technology mechanism** In the 2019 policy paper, the Chinese government identified digital equality as a priority goal, and presented the Digital Village Strategy, for which the goal is to close DD between rural and urban areas (NAN, 2019). Satellite-to-broadband Internet connectivity would be offered to rural people who do not have direct access to fiber-optic infrastructure or bandwidth in areas with digital infrastructure networks. Hence, this mechanism would be established in China as power only (Garrity & Hussar, 2019).

**Knowledge mechanisms** According to the World Knowledge Index report (2020), students' performance in math and science improved, the number of universities listed around the world increased, and investment in

research and development increased. Hong Kong is China's administrative city ranking the 10<sup>th</sup> in the world's classification of knowledge for very high technology and knowledge, as a mechanism for bridging the knowledge gap. During the COVID-19, the Chinese government coordinated regional and local education strategies to teach alternatives to e-learning. Basic digital skills are essential for citizens, while intermediate and advanced digital skills of employees are required to achieve and improve digital equality (Songa et al., 2020).

**Electronic mechanisms** China Internet Report (2020) emphasizes the importance of building a digital infrastructure network, especially in smart cities, data security, information infrastructure security, network security, and surveillance systems. Technology enhancement promotes research and development of enhanced 5G and 6G networks of mobile phones as mechanisms to bridge the e-divide.

## China's Experience In Applying E-Governance

ICT-related industry, e-governance, and e-business sectors lifted China among the ranks of developed countries in terms of economic growth. Chen (2014) found that openness, accountability, and transparency improve productivity, and promote e-governance for SD through the implementation of 2006-2020 National Information Strategy, in addition to the realization of a sustainable e-governance system, and a unified management system.

These criteria evaluate the effectiveness of e-governance, chiefly information transparency, information security, risk management, local government information network, and a unified platform, where the e-governance initiatives use intranet networks to share internal information, and extranet networks to share non-secret information. E-identity is verified with the implementation of the "Electronic Station Passage of Corporate Services" program and designation of entire village and city center as e-governance platforms, and internal affairs information systems (Du and Yang, 2019).

The Global Cybersecurity Index GCI is a composite indicator that assesses commitment to cybersecurity. The government has controlled the Internet at its borders since 2010. Moreover, the National People's Assembly passed cybersecurity to modernize databases and the Internet Utilization Systems in November 2016. The Jiangxi model supporting the unified networks and SD is important for e-governance evaluation. Thus, the model is divided into five units, namely the Unified Institution, Leadership, Unified Planning Performance, e-Platforms, and Security (Wagner, 2017). According to the study by Aichholzer et al. (2020), participation requires attention and public expression in governance, where awareness and participation are methods of influencing public policy. Trust in government increases as a result of its interaction with current events (Green Growth Knowledge, 2016). China has a strategic role in achieving its goals and the SDGs in general by proactively promoting the information industry. The study by el-Shafei and Metawe (2021) analyzed the 2007-2017 trade regulations between Egypt and China, as China provided development assistance that promoted policy interdependence, in line with the 2030 SD Plan through the Belt and Road Initiative. Furthermore, the Egyptian political leadership (2019) commended this comprehensive Egypt-China strategic partnership in 2014, which was implemented locally in 2016 through an executive program. The aim of this program is to strengthen the partnership over five years, creating a framework for working with a partner aware of common interests, both in the bilateral framework in various fields and at the international and regional levels, with general regard to the security and stability of the Middle East.

## India's Experience

**Mechanisms of Bridging DD:** Broadband in rural areas, and Internet access coverage achieve digital inclusion and digital advanced skills in application systems where the provision of digital services in Indic languages, and the creation of digital documents can be acquired and stored in a cloud system (Prasad, n. d.). Biometric identification systems have improved the efficiency of government functions de-

termining authority. These systems also helped prevent counterfeiting or duplication, and are seen as a tool for employee accountability (Vitor & Yong 2018). In 2018, a new digital strategy to bridge DD by 2022-2023 was achieved through physical connectivity between all provinces, government buildings, and digital development (Strategy New India, 2018). In knowledge infrastructure, India is in the middle, ranking the 75<sup>th</sup> out of 138 nations, according to the 2020 Global Knowledge Index. India has a CyberSecurity Policy, and a National CyberSecurity Strategy. All of these can be seen as mechanisms to close the digital skills gap.

## **E-Governance In India**

India depends on e-governance to involve stakeholders in decision-making, and make governments more responsive and accountable. India faces complications like institutional reengineering (Aggarwal, 2017), evaluation of e-service initiatives and projects for municipalities and e-governance at the state level in (NESDA report, 2019). Standards of service evaluation include access, content availability, usability, privacy and confidentiality of data, provision of services, integrated services, and service status tracking. Blockchain or smart contract e-signatures support e-accountability procedures depending on e-controls (Devi, 2014). Payments support e-invoicing, especially for those that have e-identification which protects the privacy and security of financial data.

## **UAE Experience**

UAE is a Middle Eastern country that has made strides in terms of digital transformation. The UAE enjoys political stability and plays a diplomatic role among the countries of Asia-Pacific, the Middle East, and the Arab world and has played a leading role in development, which earned it a membership in the UN Security Council for the period (2022-2023).

**Mechanisms to bridge the digital divide in the UAE** In the UAE, the rate of intelligent transformation of online services has reached 98.18%, Internet usage reached 99% in January 2020, up from 91% in 2016 and Broadband ranked second in terms of mobile speed and 27<sup>th</sup> in terms of fixed broadband speed worldwide (illiteracy eradication, n.d.). Thus, broadband and smartphone become as mechanisms to bridge technological DD.

Mechanisms to bridge knowledge gaps include illiteracy, which is not a barrier to internet users in the UAE, where it is less than 1% (Knowledge Report 2020), and where it performs outstandingly, ranking 9<sup>th</sup> out of 138 countries, and 9<sup>th</sup> out of 56 countries with very high development, and quality in scientific research institutions, due to the state's interest in the educational sector, digital literacy, and the establishment of digital knowledge centers that includes digital learning initiatives from knowledge platforms. The e-gap represented the cybersecurity and framework the Emirate of Dubai's comprehensive intelligent transformation. The Unified Register of Employees of the Government of Dubai project in collaboration with the Government Department of Human Resources and the Dubai Center for CyberSecurity manage and monitor employee data in a unified framework (Smart-Dubai-completes, 2021).

## **UAE' Experience Of E-Governance**

The shift to digital government and access to global digital maturity provide a transparent mechanism to measure each emirate's progress towards digital transformation (Digital Maturity Model, 2021). In 2018, the UAE launched a Blockchain strategy to convert 50% of the digital transactions to Blockchain platforms that allow people to complete the majority of their transactions in a unique fingerprint of digital data that cannot be hacked or altered. This technology saves time, effort, and money (Emirates Blockchain Strategy, 2021), and depends on, for example, a billion sheets of paper every year. Dubai's paperless transaction policy, launched in April 2017, could save enough money (Initiatives/paperless, 2021) and governmental character-

istics (Al-Obthani et al., 2019), which draw on the general use of e-governance in terms of cost and time to improve accountability, transparency, and participation, since they reflect the development of the ICT sector, and improve business opportunities, and information interaction between different stakeholders. This builds trust within the government (Alghawi et al., 2019). The UAE prioritizes data security while ensuring cyberspace flexibility and availability of technology advancements to combat cyber risks and attacks. These risks are addressed by the Gulf States’ improved and implemented cybersecurity strategies (Dubai-CyberSecurity-Strategy, 2021). Citizens’ e-participation, particularly smart transactions, has resulted in increased citizen well-being and satisfaction, with the UAE ranking among the top countries in the satisfaction index.

### Empirical Results And Discussion

This paper presents the results and discussion of the comparative analysis, outlining the application of e-governance in international experiences, based on the role of mechanisms in bridging DD, to draw lessons and adapt them to the Egyptian case or other countries desiring to achieve SD, focusing on the transparency and effectiveness of institutions.

**Table 1** summarizes the key findings in prior comparative and descriptive analyses in the United Kingdom, China, India, and the United Arab Emirates.

- 1- Each country’s DD differs in technological dimensions such as physical internet connectivity as digital infrastructure, intermediate and advanced levels of technical education ,and R&D, which impacts employment options, and the e-divide such as cybersecurity.
- 2- The key means for bridging the technological gap include broadband, smartphones, and digital networks. Improving digital skills, enabling innovation, particularly in new technologies such as data science, achieving digital equality in e-learning, eliminating illiteracy, and utilizing digital learning, digital research, and development as mechanisms to bridge the knowledge, while gaps in cybersecurity, digital biometric identity, and unified platforms are all considered bridge-building mechanisms..
- 3- There is a relation between mechanisms to bridge DD and the promotion of e-governance. Effectiveness of e-services include integration services, unified platforms, deployment of e-invoicing systems, and flexibility particularly through Blockchain applications. More transparent initiatives and government openness appear in financial projects. E-accountability uses unified rules, laws, e-legislation, and improves cybersecurity, and judicial censorship on the internet.
- 4- The implementation of e-governance in developing countries such as China and India, achieves sustainable socio-economic development goals. It is important that implementation is adapted to the Egyptian context and Arab and African countries that have similar conditions. This is explained in the discussion and recommendations.

**Table 1- Comparing International Experiences On Mechanisms To Bridge The Digital Divide To Enhance E-Governance**

Country Experience	Mechanisms To Bridge The Digital Divide -Technological -Knowledge -Electronic	E-Governance Effective Standards			
		E-Service	E-Participation	Information’s Transparency	E-Accountability
UK	Broadband spectrum+ innovation leader+ increase digital competence+ data protection law +cyber strategy	- Integrated Service - Digital Public Service Delivery - Agile Government - AI in Healthcare - Online Learning	Participation between the government and stakeholders, citizens through social media network	Information Transparency Through Applications And Initiatives - digital identities	Accountability And Governance In AI -Regulatory Cyber-security

Country Experience	Mechanisms To Bridge The Digital Divide -Technological -Knowledge -Electronic	E-Governance Effective Standards			
		E-Service	E-Participation	Information's Transparency	E-Accountability
China	Digital Broadband + Satellite Networks + Fiber Optic + Cloud System + Smart Village Strategy Digital Justice + Online Learning Alternatives + R&D +5G,6G+ Unified Platforms	The direction of e-services for the implementation of the National Information Strategy + establishment of information centers for the community	Awareness and Participation - proactive promotion of the information industry	Unified management system, openness and transparency of government	Judicial Censorship of the Internet: Consolidating Organization and Accountability of Leadership through E-Regulate
India	- Rural Digital Broadband + Indic Language Digital Identification -Digital Biometrics + Cloud+ R&D-Cyber Security	Service status tracking Providing a guide on how to use the service for citizens - E-invoicing system for public services	Share To Citizens On A Public Cloud	Blockchain technology to achieve transparency and accountability in financial projects	institutional reengineering using e-regulations and legislation governing these systems, electronic contract e-signatures
UAE	Broadband + Cellular + Internet Speed -digital literacy overrides literacy + protect data-unified employee registry	-Using Smart Services Index -Blockchain Platforms	-Social Media Network -Happiness Of Citizens Index	- Satisfied with e-openness, visiting government websites for e-information	adopting cybersecurity initiatives

Source: prepared by authors

The research found that every country has a DD, but differs in terms of level according to technological, cognitive, and e-dimensions, as seen in the United Kingdom and the United Arab Emirates in using the internet. In China and India, the divide is between rural and urban locations, which match the literature review with Singh's (2012) study on a geographic gap, Gable (2013) on innovation gap, and Al Izki & Weir (2014) study on knowledge and cybersecurity gap. This result was supported by a theoretical analysis of DD in the overall definition of OECD, and by the theory of DD in economic and social resources, as signified in the UK and UAE. Indicators of knowledge depend on the higher and technical education system, according to the Global Knowledge Report (2020).

According to the second and third results, the mechanisms that bridge the digital technology, knowledge, and e-divide have changed significantly, with an effective impact on e-governance benchmarks due to the differentia of e-services, like UK integration of e-Services, e-invoicing System in India, Digital Village Services in China, and Blockchain in the UK. This conformed with the findings of a study by Olalekan & Ibieta, (2017) on the impact of technology on education and health care in Nigeria.

Mechanisms bridging the knowledge gap affect e-participation among governments, citizens, stakeholders, and decision-makers in developed countries, such as citizens sounding their opinions on public policies via social networks and government sites. It was different in developing countries since China's intranet networks and unified platforms intensify e-legislation, and build trust in governments. While Arab countries, encouraged e-regulatory initiatives as the UAE, they attained digitally maturity.

There is evidence of strengthening practical mechanisms to bridge the knowledge gap in the UK, China, and the UAE, such as the Global Knowledge Report (2020), which ranked the UK and Hong Kong as ninth and tenth, respectively. Hong Kong ranks second in pre-university education, and sixth in ICT and innovation. The UK is sixth in R&D, and second in university education, while the UAE is tenth in pre-university education despite being the second-largest economy in the world. Evidence according to the UN report (2020), the UK, China, and the UAE have very high indicators of online Services and e-Participation.

E-governance is one of the tools of digital public administration. Moreover, results emphasized the relationship between the application of e-governance and the acceleration of SD, which is compatible with the Working Papers on Public Governance OECD No. 35, (2020). Integrated public governance requires the systemic application of a set of governance tools that can support governments by successfully implementing the SDGs, which necessitates high-quality data and evidence. Government officials' skills and resources, strategic performance, monitoring, and evaluation techniques are performance-based budgeting, impact evaluations, and stakeholder partnership.

**Table 1** shows the significance of cybersecurity as a mechanism in bridging the e-gap, and enhancing the effectiveness of services, e-participation, and e-accountability, as approved by Global CyberSecurity Report 2020. The UK is the second-ranking, and the UAE is fifth, followed by India in the 10<sup>th</sup> rank while China ranks 33<sup>rd</sup>, and Egypt ranks 23<sup>rd</sup>. These countries are equal in legal indicators but differ in technical indicators, organizational indicators, and cooperation, in the global cybersecurity index (2020).

Based on the evidence presented above, a positive relationship between mechanisms bridging DD and enhancing e-governance is found in four countries. Technological, cognitive, and e-mechanisms have an impact on the differentiation of e-services, e-transparency, and e-participation when it comes to openness, accountability, and impact on growing digital economy, especially during and post the COVID-19 pandemic. Hence, e-governance has become the cornerstone for accelerating SD. Thus, this practical contribution to the present study, fills the research gap in previous studies, and provides practical lessons for many developing countries in general, and Egypt in particular.

## Conclusion And Recommendations

All countries provide varying dynamics in the context of e-governance. To bridge the digital divide, the UK, China, India, and the UAE are all using technology mechanisms, Cognitive abilities and attention to digital education, as in the UAE, are measured based on global knowledge metrics. The methods for training and digital development at the cognitive level depend on how citizens', workers', and individuals' cultures and levels of awareness influence their behavior

While UK, China, and India have a unified platform system that relies on electronic identity procedures, the UAE has a platform for the usage of blockchains. Countries have different cybersecurity measures depending on how they anticipate the digital transformation, such as UK, China, and India from developed nations in terms of e- protection, data privacy, and protection from e- corruption, as in India. At the level of Arab nations, the UAE has measures to protect government data.

The effectiveness of e- services such as integrated services using AI and IOT technology in UK, China, and the UAE is highlighted by the World Government Report. E- participation between citizens, government, and stakeholders, through social communication, and public computing as in India E- transparency through initiatives, electronic content, reliability, and accuracy of information such as UK, and open governments such as the UAE.

One of the most important e-governance models proposed by China for long-term development is based on unified platforms, unified organization and leadership, unified planning and organization, unified standards, and unified security management, as this model achieves vertical and horizontal integration, comprehensive connectivity, and long-term policymaker support. Developing countries such as Egypt, which aims to achieve Vision 2030 while also improving transparency and efficiency in government institutions, can adapt this model to become as leader for other developing and African countries facing similar economic and social challenges. The UAE's smart government model is based on vertical and horizontal integration, comprehensive connectivity, and long-term policymaker support.

### ***Practical Economic And Social Implications***

There are several implications of this study for researchers, public employees, policymakers, and the wider society.

The impact of such mechanisms appears in digital inclusion, reduction of government expenditures, rationalization of costs, and overcoming corruption in finance and administration. Thus, the government has to establish institutional efficiency, and transparency as socio-economic development goals, through digital strategies that optimize digital economic resources on macro and micro levels, as well as social implications creating added value to the socioeconomic ecosystem as digital social justice while raising the digital economic growth. The main contribution of this research is offering solutions according to the following recommendations for the current Egyptian context in particular and other developing countries in general.

### **Recommendations And Solutions To Egypt**

The study presents e-governance solutions to manage a wide range of projects, including Citizen Service, transparency, and accountability Solutions, by mechanisms of bridging DD.

#### ***First . Mechanism to bridge Egypt's rural-urban digital divide***

##### **1- Technological Mechanisms, such as Broadband Fixed and Mobile.**

- Satellite over broadband
- Affordable Internet access and deployment in all governorates via telecom providers.
- A high-speed internet connection to maximize the efficiency of e-services.

##### **2- Knowledge Mechanisms**

- Promoting literacy, particularly among young people.
- Updating higher education, technical education, and smart universities, particularly in new technologies such as AI, cloud computing, and cybersecurity.
- Expanding continual education and training to strengthen the digital abilities of government personnel in basic to advanced abilities.

##### **3- Electronic Mechanisms**

- Creation of unified platforms for integrated e-services.
- Attention to the content of government websites and their regular updating.
- Ensuring the accuracy and reliability of the published information to achieve e-transparency.
- Activating cybersecurity laws to achieve data protection and confidentiality.

#### ***Second, implementation of proper e-governance paradigm in the Egyptian context***

- 1- The level of government includes significant sectors, such as education, health, agriculture, industry, and finance, including taxes and customs.
- 2- The level of local government in 27 governorates.
- 3- The level of developmental projects and public services, such as decent living projects.

#### ***Third, improving e-governance to support the accomplishment of Vision 2030***

- 1- The digital awareness industry leads citizens through awareness campaigns on the importance of e-participation in opinion and feedback. Citizens identify issues in government-driven programs and decisions, implemented via the government portal, ministries' websites, and opinion links, or by submitting complaints.



- 2- E-governance principles include e-services effectiveness, information transparency, e-participation, and e-accountability. Promoting partnerships with policymakers and development partners, such as the private sector, civil society organizations, and international organizations.
- 3- Citizens share in making public policies, influencing public services through e-participation on government social media pages. Furthermore, e-participation is a tool to enable the Egyptian President's recommendation for a national dialogue, which signifies the activation of democracy.
- 4- Egyptian government databases unified with integrated e-services, and an administration control system to overcome e-risks, and ensure data privacy and security protections from hacking, through the use of big data technology, Blockchain systems, and backups of data servers to keep them in safe places far from the used servers.
- 5- Unified citizens' digital identities allow them to register only once at the government's central gate. The focus is on projects such as empowered e-services, including electricity, energy, water drainage, educational services (high, middle, basic, and technical education), and the improvement of agricultural systems, particularly to the new project "Egypt Future".
- 6- The Egyptian government designates unified platforms for integrated e-services to avoid repetition, and enhance responsiveness to citizens as customers.
- 7- The implementation of e-governance initiatives can help lower the index of financial and administrative corruption in Egypt and facilitate the accountability of controllers (Central Accounting Authority - Management Control Authority - Follow-up and Oversight Departments of Cabinet Information Center and Decision Support) through the e- links between these agencies, the central government, and the department of e-governance systems of the Ministry of Information and Communication Technology.

This study proposes that actors of e-governance tasks at the level of government actors include the Prime Minister as a strategic and technical partner, and the Ministry of Planning, Follow-up, and Administrative Reform to oversee the implementation of Egypt's Vision 2030 for institutional efficiency and transparency, and the Ministry of Information Technology and Communications in cooperation with technological service companies to implement e-governance.

### **Limitations**

The researchers relied on reports and papers produced by the countries under consideration because they could not conduct interviews with officials serving as responses from the policymakers of those nations.

The Egyptian Ministry of Information and Communications Technology, in partnership with the German Agency for International Cooperation on Business, produced a procedural guide on the organizational structure of the units of information systems and digital transformation in December 2021. For each institution, it intends to establish technical units and governance units so Egypt is seeking the use of e-governance.

### **Future Research Agenda**

This research demonstrates the need for future studies and emphasizes the following aspects:

- 1- Studying DD at the country level in the Middle East and focusing on the cybersecurity gap between these countries.
- 2- The impact of e-governance on sustainable development, in light of the Ukrainian –Russian crisis.

### **Aknoledgment**

The Authors Would Like to Thank Dr. Khaled Hussainey, Professor of Accounting and Financial Management at University of Portsmouth in the UK, For His Workshop on Academic Writing.

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