

www.jpis.az

15 (2)
2024

Development index and the challenges of adopting artificial intelligence in improving the quality of e-government services to citizens in Jordan

Mohammad Ali ALQudah¹, Leyla Muradkhanli²

¹Khazar University, Baku Azerbaijan

¹Directorate of Information Technology and Electronic Transformation, Jordan

² Baku Higher Oil School, Khojaly ave. 30, AZ1025, Baku, Azerbaijan

²Institute of Control Systems, B. Vahabzade str., 68, AZ1141 Baku, Azerbaijan

¹Mohammad.ali@khazar.org, ²leyla.muradkhanli@bhos.edu.az

¹<https://orcid.org/0000-0002-5031-6375>; ²<https://orcid.org/0000-0001-6149-4698>;

ARTICLE INFO

<http://doi.org/10.25045/jpis.v15.i2.04>

Article history:

Received 22 January 2024

Received in revised form

29 March 2024

Accepted 31 May 2024

Keywords:

artificial intelligence

machine learning

e-government

telecommunication infrastructure

index

human capital index

online service index

e-government development index

ABSTRACT

The purpose of this study is to evaluate the global and continental positions of e-government models in countries such as Jordan by analysing their experiences. The evaluation of the progress of e-government is carried out using a multi-practice methodology, which incorporates a variety of different procedures and techniques. The performance of Jordan is evaluated using the United Nations e-government maturity index, which is comprised of the Telecommunication Infrastructure Index, the Human Capital Index, and the Online Service Index. These indexes are used to compare Jordan's performance from 2008 to 2015. The purpose of this research is to improve the capabilities of e-government by utilising previous experiences, addressing deficiencies, and making the most of potential. In addition to this, the study investigates the influence that artificial intelligence (AI) has on the confidence of users and the quality of government services that are delivered through online platforms. Specifically, the report underlines the cost-effectiveness and efficiency of adopting and utilising artificial intelligence, as well as the potential of tools and solutions that are driven by artificial intelligence.

1. Introduction

The swift and uninterrupted advancement of information technology has given rise to the cognitive revolution and the widespread proliferation of electronic activities during the twentieth century, thus fostering heightened consciousness. Governments must give precedence to the use of contemporary technology to enhance the efficacy of interaction and communication inside government institutions, as well as among the government, the business sector, and the public. The advent of e-government has been apparent in several domains of human endeavors, encompassing the proficient facilitation of transactions and the successful provision of services. This conceptual framework deals with the accessibility of information and

services over a publicly accessible electronic network. The incorporation of various information technology tools, including computers, the Internet, and websites, plays a crucial role in facilitating the integration of information, enabling electronic service updates, and improving overall efficiency (Alqudah & Muradkhanli, 2021). The e-government aims to improve engagement between the public sector and people through electronic platforms for the provision of public services. This method utilizes the Internet and network platforms to streamline procedures, enable limitless scalability, save expenses, and minimize the effort demanded from all stakeholders. The term "governmental" pertains to things or actions that are associated with the governing body of a political entity. A significant number of governments that have embarked on the endeavor

have effectively executed the preliminary phases of e-government, consequently facilitating its operational capabilities. The beneficiaries actively participate in the process of retrieving knowledge using online platforms, particularly the Internet, and are currently in the first stages of their developmental journey (Alqudah, 2021c). The implementation of e-government entails the construction of a comprehensive framework that enables the seamless delivery of online services, which can be accessed over the Internet. The primary objective of this framework is to enhance the organizational and cognitive capacities of individuals, empowering them to efficiently participate in and fulfill their official obligations and duties.

Like other countries, Jordan is not exempt from the transformative effects of the digital revolution and renaissance. Due to the widespread use of technology around the world, e-government has become necessary, even though it comes with a lot of problems and resources are hard to get. Nevertheless, it is imperative to use e-government as a means of adapting to the ever-changing technological environment (Alqudah & Muradkhanli, 2021). As a result, there have been endeavors undertaken to execute the e-government project, which is designed to be a comprehensive undertaking aimed at bolstering the investment sector. The primary goal of this effort is to facilitate progress and strive towards the creation of a society characterized by effective information utilization and dissemination. The objective of this research study is to analyze the impact of e-government on the development of citizen-government relationships and the improvement of institutional interactions. The primary subject of this study is Jordan's e-government website, with a particular emphasis on comparing its achievements to those of other governments around the world. This evaluation is conducted by the United Nations Report on sustainable development, which provides a comprehensive framework for assessing governmental performance. This study aims to evaluate the capacity of the website to incite activity, facilitate advancement, track growth, and cultivate competitiveness in this field.

This research focuses on the difficulties encountered when implementing AI to enhance the quality of e-government services provided to residents in Jordan. Although AI has the potential to improve government services, some challenges impede its effective deployment. The constraints may include a lack of AI experience and skills, insufficient infrastructure, data privacy issues, and

the need for legal frameworks to ensure the secure and ethical use of AI in the public sector.

This research aims to examine the correlation between the development index and the obstacles faced in using AI to enhance the quality of e-government services provided to residents in Jordan. The research's objective is to pinpoint the specific obstacles encountered by the Jordanian government while incorporating AI in the public sector and investigate viable strategies to overcome these obstacles. In addition, the research aims to evaluate the influence of AI implementation on the caliber and effectiveness of e-government services, as well as its consequences for public contentment and involvement. (2020 United Nations E-Government Survey | Multimedia Library - United Nations Department of Economic and Social Affairs, n.d.; Alqudah & Muradkhanli, 2021). The aim of this methodology was to comprehensively grasp the fundamental nature of the phenomena being studied and analyze its present condition. Furthermore, the researchers employed a comparative methodology to compare the execution of the e-government project in Jordan with those of prominent nations. In addition, the researchers actively consulted the United Nations report on sustainable development for the year 2022 to foster meaningful dialogues. The present study is categorized as analytical quantitative research. It relied on secondary sources of information, notably data extracted from the United Nations database and United Nations e-government reports covering the period from 2008 to 2022. This study enhances current knowledge by investigating the difficulties and advantages linked to the use of artificial intelligence in the context of e-government services in Jordan. The research delves into the theoretical elements of implementing AI and offers valuable insights into the factors that impact the effective integration of AI technology in the public sector. The results of this study can provide valuable insights to policymakers, researchers, and practitioners in comprehending the intricacies of AI implementation and devising effective approaches to overcome obstacles and optimize the advantages of AI in e-government services.

AI is a fundamental component in several sectors, providing numerous benefits through innovative and creative services. Consequently, AI has the potential to improve scalability, efficiency, and accuracy. AI harnesses a multitude of advantages and combines them with statistical analysis and extensive datasets (Alqudah, 2021a, 2021b). Trend research suggests that AI is of paramount importance in driving the progress of

business models, policies, and organizational strategies. This supports the progression from descriptive research and trend detection to more advanced, proactive, and evidence-based models and procedures. AI has been widely employed in several sectors, including the discovery of patterns associated to health-related vulnerabilities and insurance risks.

This research has practical value because it can influence Jordanian government policy and decision-making. By discerning the obstacles and prospects of implementing AI in e-government services, policymakers can formulate focused policies and initiatives to augment the caliber and effectiveness of public services. The research findings can provide guidance for the allocation of resources, training programs, and infrastructure development needed to effectively apply AI in the public sector. The primary objective of this project is to strengthen e-government services in Jordan, resulting in improved citizen happiness, increased efficiency, and enhanced governance. (Mohan et al., 2023). These encompass the deployment of self-governing databases that possess the potential to independently rectify and enhance themselves by employing machine learning (ML) methodologies. Furthermore, the use of pre-existing AI models may be leveraged to conduct analysis on diverse datasets and address challenges such as iris recognition and textual analysis. Both examples serve as representations of what are often known as autonomous databases. The implementation of this strategy holds the capacity to accelerate the achievement of value for companies, while simultaneously improving operational effectiveness, decreasing costs, and strengthening client connections. The incorporation of AI into governmental services has significantly contributed to their progress, resulting in the acknowledgment of AI as an essential element of electronic government. As a result of the widespread use of technology gadgets, notable organizations, including huge enterprises and governmental organizations, have benefited from increased convenience in developing a customized framework and strategy to assist the procurement of electronic services.

2. Related work

The primary objective of the study conducted by (Alqudah & Muradkhanli, 2021; Faid et al., 2020) is to examine the correlation between e-government and productive performance, with a special focus on income levels. The objective of this study is to get a deeper understanding of the

possible advantages associated with the implementation of e-government in addressing corruption, minimizing expenses, and minimizing unethical behaviors. Furthermore, the research centered on tactics aims at enhancing the efficiency of e-government in attaining productivity results linked to varying levels of revenue. The study's results reveal a favorable correlation between the implementation of e-government and the per capita gross domestic product. Moreover, the study unveils that middle-income nations assume a crucial part in propelling worldwide economic expansion by means of their establishment and endorsement of information and communication technology infrastructures. The findings of the study also indicate that an increased level of interest in electronic services contributes to the improved effectiveness of public sectors operating under e-government frameworks. The present study serves as the basis for our research article, with the objective of establishing a favorable association between income level and e-government. The variable in question is incorporated as a factor that exerted influence on the development and progression of e-government in the country of Jordan.

According to (Nawafleh et al., 2012) sought to identify the primary elements that govern the progression of the encompasses the efficacy of e-government, along with a juxtaposition of the divergent factors distinguishing developed and developing nations. This examination is substantiated by a case study involving Finland, an exemplar of an advanced nation, and Saudi Arabia, representative of a developing nation. The findings of this study indicate that there exist several crucial factors common to all countries, which play a pivotal role in fostering maturity and progress. The concept of e-government encompasses several components such as infrastructure, people capacities, educational system growth, and organizational levels. The examination of these aspects is conducted by analyzing the programs implemented by both nations and the obstacles encountered throughout their implementation. The present study successfully addresses the issue of comparability between countries with varying ingredients, as well as the potential benefits derived from the experiences of leading nations and the utilization of factors that have been empirically associated with e-government.

The study conducted by (Alqudah & Muradkhanli, 2021) also examines the evaluation of obstacles. This study examines the accomplishments

in e-government within the countries of the European Union from 2008 to 2014. It specifically focuses on the crises experienced by the European Union during this period and their influence on e-government. Additionally, it evaluates the effects of various factors associated with e-government. The research paper proposes a methodology for selecting the most suitable indicators for assessing the level of government maturity. Numerous organizations and researchers have put forth the concept of electronic government, commonly referred to as e-government. Among the various indices assessing e-government development, the one presented by the International Union stands out as the most commendable. This preference is primarily attributed to the index's ability to maintain a coherent sequence in its reports, ensuring chronological consistency. Additionally, the index encompasses a wide range of countries, making it the most comprehensive in terms of coverage. This analysis examines the impact and distinctions observed in the realm of electronic government, with a particular focus on the incremental advancements made. Additionally, a projection is made asserting that Denmark will emerge as the leading nation in terms of e-government development. Subsequent evaluation reveals that this forecast has indeed materialized. The selection of the e-government development index for measurement and comparison is based on this study, as it is considered the most complete and reliable indicator.

According to the researcher (Alqudah, 2021a) AI encompasses a diverse range of approaches and disciplines, such as vision, perception, voice, dialogue, decision-making, planning, problem-solving, robotics, and other applications that facilitate autonomous learning. AI may be comprehensively conceptualized as a collection of technologies and methodologies employed to enhance and supplement innate human qualities, including cognitive capacity, analytical prowess, and other aptitudes.

AI has the potential to contribute to advancements in several areas encompassed by the United Nations Sustainable Development Goals (SDGs), hence enhancing sustainable and economic development. However, it is crucial to acknowledge that the use of AI also has substantial social, economic, and ethical implications. Consequently, several governments and organizations are strategizing to adopt and use these technologies on a wide-ranging basis. The progress made in the field of AI is closely interconnected with the establishment and enforcement of data rules, particularly those

pertaining to data protection and privacy.

Significant advancements are being made in research laboratories, company boardrooms, and other industries such as robots and communications networks, alongside the use of AI by consumers. The degree of impact exerted by AI on various nations and regions is contingent upon their economic framework and the level of digitization in key sectors, such as healthcare, agriculture, and manufacturing.

The International Telecommunication Union (ITU) is actively engaged in a diverse range of initiatives that explore the potential impact of AI on telecommunications and radiocommunications networks, as well as the broader information and communication technology (ICT) ecosystem.

The establishment of a resilient facilitating framework has significant importance in promoting innovation and ensuring the dependable implementation of AI technologies. In the process of policy creation, it is important to consider the specific needs and requirements of various user groups to prevent bias and provide equitable access to the advantages offered by AI. This includes but is not limited to marginalized communities, children, those with disabilities, and indigenous populations.

AI encompasses a diverse range of technologies that may be broadly categorized as "adaptive self-learning systems." There exist several approaches of delineating the concept of AI:

- Regarding technology, techniques, and/or approaches, such as the use of neural network methodologies for machine translation.
- Regarding the objective of the technology, namely in the domains of face recognition and picture recognition.
- In relation to cognitive abilities, such as language comprehension, picture recognition, problem-solving, and learning, as defined by the Cambridge Dictionary.
- In relation to various technological instruments, apparatus, or computational procedures (e.g., robots and autonomous vehicles).

AI encompasses a broad range of approaches and disciplines, such as vision, perception, speech recognition, conversation systems, decision-making, planning, problem-solving, robotics, and several other applications that facilitate autonomous learning. AI may be comprehensively conceptualized as a collection of technologies and methodologies employed to enhance and amplify ordinary human traits, including intellectual

capacity, analytical prowess, and several other innate abilities. Recent advancements in computer processing, power, and speed have significantly improved AI, ML, and contemporary data technologies. Furthermore, the progress made in AI is reliant on the advancements achieved in data technologies.

E-government pertains to the utilization of digital technology and information systems by governmental organizations with the aim of improving the provision of public services, fostering citizen participation, and optimizing administrative procedures. E-government refers to the application and incorporation of information and communication technologies inside governmental organizations operating in the public sector. According (Molnár, 2020; Salamah et al., 2022) the fundamental aim of e-government is to effectively manage data and information, improve interactive communication channels, and provide comprehensive public services, reliable information, and vast knowledge to all segments of society. It is crucial to emphasize that the definition is sourced from the United Nations Organization. The scope of e-government in the United States is limited to the utilization of information and communication technologies, which are subsequently linked to the quality and methodology of delivering governmental services to the population.

In 2022, the World Bank formulated a conceptualization of e-government as the application of information technology by governmental entities, encompassing broadband networks, the Internet, and mobile computing. This use entails the establishment of collaborative partnerships among individuals, institutions, government agencies, and other relevant parties. The primary objectives of e-government encompass the augmentation of government service provision to individuals, the enhancement of interactions with the business and industrial domain, the amplification of availability and accessibility, and the cultivation of a more streamlined government administration (Caiado et al., 2018). The provided definition emphasizes the interdependence between e-government and its internal and external electronic transactions, which play a crucial role in facilitating the government's shift away from conventional methods. In 2003, the Organization for Economic Cooperation and Development (OECD) formulated a definition of technology usage as "the application and utilization of various technological tools and systems." The importance of information and

communication, including the Internet, in improving government operations is emphasized by the Organization for Economic Cooperation and Development (OECD, 2003). The definition provided by the OECD highlights the significance of using the Internet to enhance the caliber of government services and transactions. However, it lacks explicit elucidation on the precise measures that governments should undertake in this context.

3. Variables definition and methodology development

This paper examines several methodologies employed in the measurement and assessment of e-government progress.

Researchers (Alqudah & Muradkhanli, 2021) have offered many methods for monitoring and assessing the progress of e-government. One such way, referred to as multi-practice, is recommended.

Methodology and implementation. The use of methodology includes the implementation of many methods and strategies to evaluate the certain and intangible benefits of e-government. This technique acknowledges that the many dimensions of measurement might impact the dependability of the results. Therefore, the evaluation processes may be classified into the following categories:

- The topic of discussion is the examination of challenging metrics within the realm of e-government, specifically focusing on cost-benefit analysis and standards.
- The user's text is already academic. Soft metrics are evaluation measurements that are specifically related to the registration process, different phases of e-government, and various social elements.
- The user's text does not provide any information to be rewritten. The hierarchy of metrics incorporates several elements, such as return on investment, total costs, revenues, enhancement of planning and control quality, quality of choices, information value, and system characteristics.

Research framework. Studies (Alqudah, 2021c; Arayankalam et al., 2020) propose a research framework that establishes a connection between e-government maturity evaluation and electronic trade. The study identifies five key indicators for measuring e-government maturity in this context. These indicators include:

- The concept of awareness efficiency refers to the proportionality between the overall population of internet users and the total number of clients.

- Popularity competence pertains to the categorization of a service provider or agency based on its relative position within the larger pool of agencies.
- Communication efficiency refers to a metric that evaluates the effectiveness of a website's content in terms of its relevance, security, and privacy with respect to online data, publishing, email, licenses, and other related aspects.
- Transfer efficiency is assessed by considering customer satisfaction with individual services, e-transactions within the nation, and the duration of website visits.

The concept of retention efficiency pertains to the ability to maintain client loyalty via repeated transactions and frequent visits. In the context of e-government, this concept is applied to assess the effectiveness of digital government websites. The research proposes the use of a comprehensive approach to assess websites, encompassing several methodologies such as usability testing, availability analysis, user-generated feedback, usage data analysis, and evaluation of internet performance.

Evaluating the performance of e-government.

According to the United Nations E-Government Survey 2020, specifically the report titled "Digital Government in the Decade of Action for Sustainable Development" (With Nations, 2022; United Nations E-Government Survey 2022: Digital Government in the Decade of Action for Sustainable Development (With Addendum on COVID-19 Response), 2022), the Commission for the Information Society conduct a study on the strategies required to attain the advancement of e-government. The study identifies three primary conditions that need to be met. It further indicates that the most effective approach to assessing the progress of e-government is by considering the program's objectives and the government agency responsible for its implementation. These conditions are defined as follows:

- Attaining optimal efficiency in the provision of electronic services.
- Attain optimal efficiency in the internal governance structures and procedures within the field of engineering.
- Equitable allocation of services, organizational frameworks, and human resources is necessary to effectively use and execute information and communication technologies (Isaac, 2007; Kaur et al., 2020; Kraay, 2018).

Comprehensive survey conducted by the United Nations. A comprehensive survey conducted by the United Nations, as cited by (Alqudah &

Muradkhanli, 2021) encompasses an e-government index. The present index functions as a comprehensive measure of the advancement of e-government. The procedure entails the inclusion of a quantitative metric in the report, followed by the development of a theoretical framework that incorporates the elements of e-government, e-readiness, and e-participation, in conjunction with e-government practices. The composite index assesses the capacities of governments by considering three main dimensions and offers the corresponding sub-indicators in the following format:

- The E-Service Measurement Index comprises the comprehensive evaluation and provision of service benefits, together with the assessment of service availability. The indicator is examined in previous studies conducted by (Alqudah & Muradkhanli, 2021).
- The communications infrastructure index measures the degree to which the fundamental elements of information and communication technologies are being utilized. The major parameters to be calculated in this study encompass preparedness and utilization, as discussed by (Alqudah & Muradkhanli, 2021).
- The HCI is a metric that assesses the proficiency of individuals, their educational attainment, and the government's capacity to disseminate information. This paper elucidates the significance of the three indicators in the context of assessing e-government, which is seen as an evaluative process. The use of the Internet by the nation for the dissemination of information, provision of goods and services, and the extent of wired communication infrastructure. The inclusion of wireless technology and infrastructure development, as well as the enhancement of human capital in all nations, can contribute to the attainment of reliable findings in the measuring process.

Challenges facing the adoption of AI.

Challenges facing the adoption of AI with exceptional capabilities for work in the public sector we must know the main challenges to adopting AI to e-government.

One fundamental concern pertains to the level of confidence placed in deep learning models and their transparency. The process by which these models arrive at their findings is frequently ambiguous and the models themselves may exhibit a lack of specificity and clarity (Wirtz et al., 2019). Depending on their objectives, several researchers continue to favor straightforward and interpretable AI models over more precise yet less transparent

models, despite their need for accurate predictive capabilities. There exists a divergence of opinions on the inclination of certain individuals to entrust complicated systems and challenging choices to robots, as opposed to maintaining a certain level of human intervention.

- Bias: Although AI has the potential to serve very advantageous goals, it might inadvertently engender unfavorable or unsuitable outcomes or unexpected consequences. There is an increasing level of apprehension around the presence of racial, handicap, and gender bias inside AI and ML algorithms, as well as the consequential effects they have on society at large. The efficacy of an AI model is contingent upon the caliber and volume of data utilized for training model. In practical scenarios, the labelling of data is frequently suboptimal. The standardization of data sets is necessary. The data frequently exhibits bias.
- The acquisition of data poses significant challenges in terms of availability and ownership. The establishment of best practices is crucial in determining the specific conditions under which data can be disclosed and to whom, all while upholding the principles of ownership and clear commitments to maintain confidentiality for categories of data.
- Data privacy and security are critical concerns in today's digital landscape. The occurrence of security breaches, sometimes stemming from cyberattacks, can lead to severe and devastating effects. Federated learning technologies have the potential to mitigate hazards by facilitating the training of AI models on individual devices that retain data internally, without necessitating data exchange. Concurrently, privacy-preserving technologies play a crucial role in personal data.
- One limitation in the field of AI is the inadequate knowledge and expertise among professionals about the ethical use of this technology. While AI has the potential to effectively tackle several challenges, its ethical implementation is confined to a restricted set of experts. Numerous scholars emphasize the necessity of including social scientists and policy makers in deliberations, as opposed to just considering the ethical use of AI built by a limited cohort of "technologists," computer engineers, and data scientists. Education plays a pivotal role in facilitating a comprehensive

understanding of the ethical and appropriate use of AI.

One area of interest in the field of AI is the exploration of fair uses. The research conducted in this domain involves computationally demanding processes. The disparity in access to computer power and data exacerbates the gap between a few groups of privileged corporations and institutions with ample resources, and the remainder of the global population that lacks such access.

4. Results and discussion of hypothesis development

1. Presentation and analysis of the results related to the first hypothesis research. The e-government system in Jordan is still in its initial phase, commonly referred to as the first generation. The subject under consideration exhibits several enhancements. To substantiate the veracity of this idea, we offer the pertinent aggregate data. The initial step in examining e-government is to establish a comprehensive understanding of the Jordanian e-government and its constituent elements. This entails evaluating the current state of e-government in Jordan and interpreting the outcomes of global assessments and rankings that pertain to electronic governance worldwide. Prior to presenting the data, it is imperative to acknowledge the absence of precise information pertaining to Jordan, since most international indicators are plagued by data gaps. The ensuing table delineates the ranking held by Jordan in relation to the indicators. The e-government index and its progress in comparison to nations worldwide from 2003 to 2018 are discussed in (EGovernment Program - Minister of Digital Economy and Entrepreneurship, n.d.), in the Fig.1 we explain E-Government Development Index (Jordan) between 2003-2022.

The study observes Jordan's performance on the e-government index and highlights the alteration in the e-government development index. From 2003 to 2022, Jordan saw a persistent decrease in its worldwide ranking and witnessed fluctuations in its rates, indicating a state of instability. The adoption of e-government was accompanied by several economic impediments and problems, including a significant decline in oil prices, a loss in accumulated savings, a reduction in foreign exchange reserves, and other related factors. In the realm of e-government advancement.

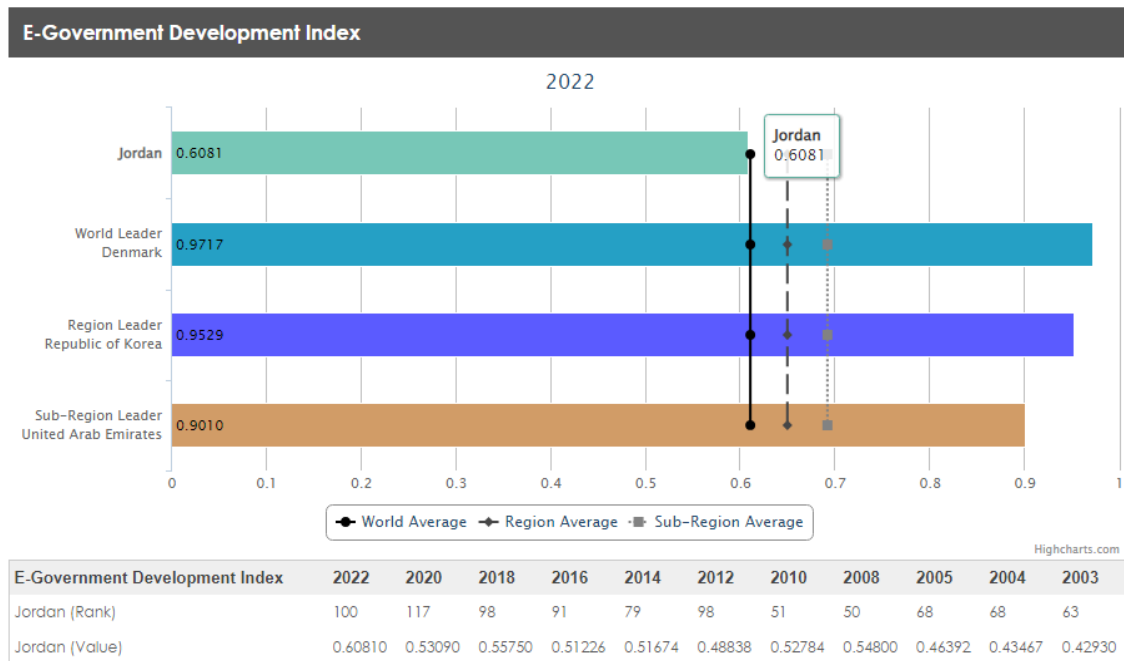


Fig.1. E-government development index 2003- 2022 Jordan

2. Presentation and analysis of the results related to the second hypothesis. The study’s second hypothesis posites that by the researcher (Alqudah & Muradkhanli, 2021). The e-government project execution in Jordan is assessed to evaluate the validity of the hypothesis. To provide a comprehensive analysis, comparisons between Jordan and other Arab nations are included in the e-government development index section of the 2020 United Nations report. This report provides a summary of the rise in the mean value of the e-government development index, which increased from 55% in the previous iteration of the report in 2022 to 61% (2022 United Nations E-Government Survey | Multimedia Library - United Nations Department of Economic and Social Affairs, n.d.).

3. Presentation and analysis of the results related to AI in the public sector according to an e-government development index. The AI for Public Sector Platform primarily emphasizes the use of AI in addressing fundamental human necessities. This includes aligning with the United Nations’ 17 SDGs, which aim to be accomplished by 2030. An example of such a goal is the “always online all year round” initiative. The primary objective of the summit is to ascertain tangible implementations of AI to promote the attainment of the SDGs and facilitate the widespread adoption of solutions with a global reach. The summit is coordinated by the Union in collaboration with 38 other United Nations institutions, with the active involvement of Switzerland.

The YouTube channel known as AI for Good

serves as a comprehensive platform with a multitude of films that showcase interviews with prominent figures in the field of AI, as well as lectures and demonstrations that highlight AI-based solutions aims at expediting the achievement of the SDGs. This channel may be considered a centralized hub for accessing a wide range of content related to AI’s positive impact on societal and economic to effectively address the evolving trends in the field of AI for the betterment of society, it is imperative to adopt a comprehensive approach. Please consider subscribing to the channel and participating in online activities to receive the latest updates and unique material. By joining the live channel, you will have the opportunity to engage in debates and explore ideas and visions pertaining to AI in relation to the pursuit of the SDGs. The channel encompasses a variety of content including keynotes, webinars, perspectives, an “innovation factory,” and social media platforms.

The ITU uses regulatory surveys and yearly monitoring to monitor the development of national AI programmers and policies (ITU, n.d.). ML models undergo training and are provided with extensive datasets. Therefore, it is imperative to consider matters of data privacy, regulation, and protection in both national policies and approaches pertaining to Internet of Things (IoT), sensor networks, and 5G networks, which facilitate data transmission. This consideration is crucial when formulating national strategies for AI.

Based on the most recent ITU Telecommunication/ICT Regulatory Survey, it is found that around 18 nations have formulated

dedicated AI policies as of 2019. However, the number of countries with sector-specific AI strategies increased to 49 by 2021. Nevertheless, the field of AI encompasses a diverse range of technologies, yet only a limited number of national programmers comprehensively address this domain. Nations should also consider the processing of data flows now being produced by the IoT and sensor networks, which provide input to ML models and AI technology. Numerous nations, such as the United

States and Saudi Arabia, formulate comprehensive approaches pertaining to the domains of 5G, IoT, and AI. As to the findings of the United Nations Conference on Trade and Development (UNCTAD, 2020), around two-thirds of nations have implemented data protection rules, encompassing the utilization of AI for developmental purposes. Fig. 2 shows the number of countries with strategies on emerging technologies.

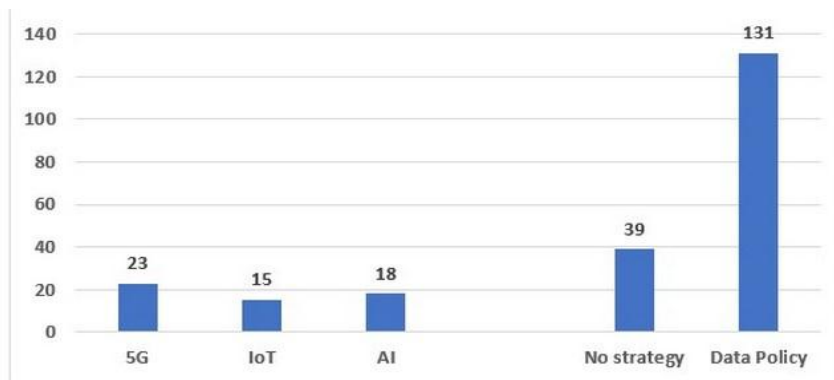


Fig. 2. The number of countries with strategies on emerging technologies

In forthcoming times, the implementation of worldwide standards has the potential to mitigate actual and perceived hazards associated with AI and other technologies. These standards, including technical specifications and prerequisites, might establish distinct parameters and enable ML to exhibit predictability, dependability, and efficacy.

The utilization of AI and ML is increasingly being incorporated into the standardization efforts of the ITU. This integration is achieved through rigorous research, analysis, and stakeholder discussions that specifically concentrate on areas such as network coordination and management, multimedia coding, assessment of quality of service, and different facets of telecommunications services management and operation. Additionally, the application of AI and ML is also explored in the context of cable networks, digital health, and efficiency. The intersection of environmental concerns with autonomous driving.

5. Analysis results

Most nations worldwide own national online portals and employ automated tools to streamline governmental operations. The efficacy of e-government has demonstrated enhancements across diverse geographical locations and in nations with disparate income levels, encompassing both the least developed and emerging countries. The research conducted an analysis of the expansion of government digital services, e-participation

initiatives, utilization of data in government operations, and the establishment of open government data portals globally (UN E-Government Survey 2020, n.d.).

The classification of several Arab nations has seen varied levels of advancement, with the emergence of novel practices aimed at leveraging modern technology to enhance governmental services and foster greater electronic engagement. The integration of digital transformation was incorporated into the national development strategies of several Arab nations. The report was derived from many indicators in the 2020 edition of the (Alqudah & Muradkhanli, 2021; UN E-Government Survey 2020, n.d.)

The e-government development index serves as the primary indicator in the study. The E-Government Development Index is a metric used to assess the level of digitalization and online service delivery by governments. It measures the extent to which the primary metric utilized in the United Nations e-government report assesses the progression of e-government implementation across 193 nations, with a scale that ranges from zero to one. The e-government development index is composed of three sub-indicators, namely the OSI, the TII, and the HCI (Nations, 2020). The e-government development index may be calculated using the equation:

$$\text{e-government development index} = 1/3 (\text{OSI} + \text{TII} + \text{HCI}).$$

- The TII is a metric used to assess the quality and development of telecommunication infrastructure in each region or country. This article discusses infrastructure issues pertaining to the accessibility and speed of Internet connectivity across various locations, including remote and rural areas.
- The HCI is a metric used to measure the level of human capital within a given population. This indicator pertains to the educational attainment, cultural awareness, and digital literacy of persons inside the country.
- The Digital Government Services Index, also known as the OSI, pertains to the simultaneous influences on the progress of e-government, encompassing aspects such as human resources, digital services, and infrastructure.

The index categorizes nations into four distinct groups based on their level of development: very high, high, medium, and poor. Within each category, the nations are further split into four sub-quarters, ranging from the lowest to the highest. The report highlights the significance of income levels in

facilitating the advancement of e-government in a nation. However, it emphasizes that income alone does not ensure the progress of e-government. Certain countries have exemplified their dedication to enhancing digital services and surmounting limitations imposed by communication infrastructure and human resources:

- For the very high category: score between (1-0.75).
- High category: score between (0.75 – 0.5).
- Intermediate Category: score between (0.5-0.25).
- The low category: Index score ranges between (0.25-0).
- According to (Alqudah & Muradkhanli, 2021; EGovernment Program - Minister of Digital Economy and Entrepreneurship, n.d.), Jordan ranked (117) in the world out of (193) countries, while it ranked (10) out of (20) Arab countries included in the report. Fig. 3 shows the e-government development index Jordan rank out of 20 country worldwide .

The low category		Intermediate category		High category		very high category	
number	Country	number	Country	number	Country	number	Country
191	Somalia	127	Lebanon	66	Qatar	21	UAE
		131	Syria	91	Tunis	38	Bahrain
		143	Iraq	106	morocco	43	KSA
		162	Libya	111	Egypt	46	Kuwait
		170	Sudan	117	Jordan	50	Oman
		173	Yemen	120	Algeria		
		176	Mauritania				
		177	Comoros				
		179	Djibouti				

Fig. 3. E-government development index out of 20 countries

The study encompasses the 193 member nations of the United Nations and evaluates the extent of e-government development using three primary indicators: the e-government services index, the TII, and the HCI.

According to the ministry’s release, the report highlights a 26% enhancement in the telecom infrastructure index value in Jordan. Specifically, the index value rose from 0.4406 in 2018 to 0.554 in the current 2020 report, reflecting an increase of 0.1134. According to the data shown in the fig. 4 Jordan was

placed tenth among the Arab countries.

In relation to the HCI, which encompasses four sub-indicators including adult literacy rate, total enrollment ratios in primary and secondary schools as well as post-secondary education, expected years of education, and average years of schooling, the report highlights a decrease in Jordan’s HCI by approximately -8 percent, resulting in a value of (0.6800) in the 2020 report. This decline occurred despite a 1 percent improvement in the adult literacy rate.

The low category		Intermediate category		High category		very high category	
number	Country	number	Country	number	Country	number	Country
20	Yemen	12	Egypt	6	Oman	1	UAE
21	Somalia	13	Lebanon	7	Tunis	2	KSA
		14	Mauritania	8	morocco	3	Bahrain
		15	Syria	9	Algeria	4	Qatar
		16	Libya	10	Jordan		Kuwait
		17	Sudan	11	Iraq		
		18	Djibouti				
		19	Comoros				

Fig. 4. Ranking TII among Arab countries

According to data from (Nations, 2020) Development Programmed for the year 2018, the ministry identified a primary factor contributing to the decline in this indicator. This decline can be attributed to a decrease in the expected years of study from 13 to 10 years. Additionally, there has been a decrease in the overall percentage of

enrollment in education due to the influx of many refugees, whose school enrollment rate tends to be lower. Furthermore, the absence of well-defined digital literacy programs has also played a role in this decline. Jordan’s ranking among the Arab countries was tenth, as evidenced by the following the fig. 5 to show the result of HCI.

The low category		Intermediate category		High category		very high category	
number	Country	number	Country	number	Country	number	Country
21	Somalia	15	Comoros	4	Kuwait	1	KSA
		16	Iraq	5	Libya	2	Bahrain
		17	Yemen	6	UAE	3	Oman
		18	Mauritania	7	Tunis		
		19	Sudan	8	Algeria		
		20	Djibouti	9	Jordan		
				10	Qatar		
				11	Lebanon		
				12	Egypt		
				13	morocco		
				14	Syria		

Fig. 5. Human Capital Index of Jordan among Arab countries

The Ministry announces the initiation of the Youth, Technology and Work initiative, which incorporates a significant collaboration with the Ministry of Education. This collaboration entails the provision of digital skills education to students in public schools, specifically those in grades seven through twelve. The curriculum designed for this purpose will serve as the foundation for imparting these essential skills.

The e-government services index assesses the level of advancement in e-government by considering various dimensions. These dimensions include the institutional framework, legal and regulatory framework, national strategies and their implementation, usage rates of electronic services, user satisfaction, speed of adopting modern technologies, regional and international cooperation, and the adoption of comprehensive and integrated government policies to facilitate development objectives. The effectiveness of Sustainable 2030 is enhanced when the interrelationships between the

economic, social, and environmental sectors are considered.

The research also highlighted a decrease in Jordan’s e-government services index, with the index value dropping from 0.4931 in 2018 to 0.3588 in the 2020 report, representing a reduction of 27%.

According to the Ministry, the measurement of the e-government services index relies on member states completing the e-government services form. The organization employs a distinct and undisclosed methodology to determine the rate of advancement or regression for countries in this indicator. In March 2019, Jordan submitted this form and was ranked twelfth among Arab countries, as evidenced by the provided data in fig 6 we see the ranking among the Arab countries when comparing the e-government services index.

The press conference conducted by the United Nations team to introduce the study emphasized the significant importance of the legal framework that regulates digital transformation.

The low category		Intermediate category		High category		very high category	
number	Country	number	Country	number	Country	number	Country
18	Djibouti	9	Syria	5	kSA	1	UAE
19	Comoros	10	morocco	6	Qatar	2	Bahrain
20	Mauritania	11	Lebanon	7	Tunis	3	Oman
21	Libya	12	Jordan	8	Egypt	4	Kuwait
		13	Iraq				
		14	Yemen				
		15	Sudan				
		16	Somalia				
		17	Algeria				

Fig. 6. E-government services index among Arab countries

This framework particularly pertains to matters such as data privacy, the presence of open data, data categorization, and electronic participation. Fig. 7

analyzes the electronic involvement and specifically focuses on comparing the rankings of Arab countries in terms of electronic participation.

The low category		Intermediate category		High category		very high category	
number	Country	number	Country	number	Country	number	Country
175	Djibouti	142	Somalia	66	KSA	16	UAE
175	Sudan	148	Jordan	73	Tunis	18	Kuwait
183	Algeria	148	Iraq	77	Qatar	38	Oman
185	Comoros	158	Lebanon	106	morocco	51	Bahrain
186	Mauritania	158	Yemen	106	Syria		
189	Libya			106	Egypt		

Fig. 7. Electronic participation among Arab countries

The Ministry reported that it focused on three key areas over the previous year following the submission of the model. These areas encompassed the categorization and administration of government data, protecting personal data, and the provision of open government data through the Ministry’s open government data platform. The objective of these efforts was to enhance transparency and facilitate electronic engagement for both citizens and the business community.

It is noteworthy that there was a significant rise of 145 electronic services and their utilization, as compared to the month of March 2019, which coincided with the presentation of the model upon which this report was based. The quantity of transactions had a notable boost during the months of March, April, and May 2020 in comparison to the corresponding months of 2019, escalating from 897 thousand transactions to over two and a quarter million moves.

6. Conclusion and future suggestion

Jordan initiated the implementation of the e-government project, known as e-Jordan 2000, which encompassed:

The holistic project under discussion served as a reliable means of supporting investment and

development initiatives, with the goal of fostering an information society that formed the foundation of a knowledge-based economy. Additionally, it aimed to enhance the interaction between citizens and the government, as well as between the government and various institutions. The findings of the research paper indicated that Jordan attained a global ranking of 117 in the e-government maturity index for the year 2022. Based on the United Nations categorization, the e-government system in Jordan is categorized as a first-generation system, indicating that it fell below the world average. However, there was considerable room for improvement and reform to enhance its effectiveness and efficiency. Despite the relatively low index performance in many countries on the continent, Jordan wasn’t able to attain sufficient results even within its own continent. Consequently, a significant disparity persisted between Jordan and other nations. The observation highlighted the significant challenges impeding the advancement of Jordan’s e-government initiative on a global scale. These obstacles primarily stemmed from deficiencies in the communication and information infrastructure. Moreover, it underscored the insufficiency of governmental endeavors’ alone in fostering progress in Jordan’s digital landscape, necessitating additional guidance, support, and cultural awareness. The significance of transitioning to electronic services was

recognized by citizens who did not hinder progress due to unfounded apprehensions. They were aware of the potential consequences and anticipate resolving issues rather than exacerbating them. It could be argued that the state's inclination towards e-government was a complex endeavor that was both challenging and achievable. However, it necessitated the initial cultivation of a societal mindset that embraced this change and prioritizes the human element, which was integral to human existence. Only then a successful transformation could be realized. The initial four objectives concentrated on the establishment of a system that facilitated AI by fostering capabilities and cultivating Jordanian proficiency in the realm of AI. This included promoting scientific research and development in the field, bolstering the investment and entrepreneurship climate, and establishing a legislative and regulatory framework that facilitated employment opportunities. The safety of AI was a primary concern, with the fifth objective specifically targeting the use of AI technologies to enhance the effectiveness of the public sector and sectors of high importance. A comprehensive understanding of the integration of AI in governmental operations and its use for enhancing the efficacy of electronic applications that facilitated e-government. This research focused exclusively on the e-government index of the United Nations programmed. This study did not include other factors related to the development of e-government in Jordan compared to other countries, such as cultural norms and values, political strategies and visions, the mass of the information society that constituted the state, and resistance to change. Future research endeavors should aim to investigate these aspects.

References

Alqudah, M.A. Artificial Intelligence in Managing the Electronic Customer Relationship and Enhancing the Level of Satisfaction with Electronic Services (June 2, 2021). <http://dx.doi.org/10.2139/ssrn.3858964>

Alqudah, M.A. (2021). Investment Artificial Intelligence in Decision-making Processes in the Jordanian Ministry of Interior. *International Journal of Innovations in Engineering Research and Technology*, 8(10), 40-53 <https://doi.org/10.17605/OSF.IO/5D7KZ>.

Alqudah, M.A. Towards the governance of government data using artificial intelligence (December 23, 2021). <http://dx.doi.org/10.2139/ssrn.3992303>.

Alqudah, M.A., & Muradkhanli, L. (2021). E-government in Jordan and studying the extent of the e-government development index according to the United Nations report. *International Journal of Multidisciplinary: Applied Business and Education Research*, 2(4), 365-375 DOI: <https://doi.org/10.11594/ijmaber.02.04>.

Arayankalam, J., Khan, A., & Krishnan, S. (2020). How to deal with corruption? Examining the roles of e-government maturity, government administrative effectiveness, and virtual social networks diffusion. *International Journal of Information Management*, 102203 <https://doi.org/10.1016/j.ijinfomgt.2020.102203>.

Caiado, R. G. G., Leal Filho, W., Quelhas, O. L. G., de Mattos Nascimento, D. L., & Ávila, L. V. (2018). A literature-based review on potentials and constraints in the implementation of the sustainable development goals. *Journal of Cleaner Production*, 198, 1276–1288 <https://doi.org/10.1016/j.jclepro.2018.07.102>.

E-Government Program - Minister of Digital Economy and Entrepreneurship. (n.d.). Retrieved March 8, 2021, from https://www.modee.gov.jo/En/Pages/eGovernment_Program

Faid, G., Tariq, M. M., Ishtiaq, A., Zeynvand, V. L., Meyer, D. F., & Máté, D. (2020). The nexus of E-government and increased productivity relative to income level comparison. *Business, Management and Economics Engineering*, 18(1), 88–105. <https://doi.org/10.3846/bme.2019.10409>.

Mohan, N., Prasad, K. D. V, Soujanya, K., Dobhal, D. C., Ali, M., & Tripathi, M. A. (2023). An Adaptive Service-Oriented Business Management Pattern Based on Machine Learning Rule ML. 2023 3rd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), 1672-1676. doi: 10.1109/ICACITE57410.2023.10183158.

Molnár, P. (2020). Measuring e-government and e-participation. Prof. Dr. Miskolczi-Bodnár Péter (Eds.): *Jog És Állam 29. Károli Gáspár Református Egyetem Állam-És Jogtudományi Kar, Budapest* <https://doi.org/10.1787/19901054>.

Nations, U. (2020). United Nations E-Government Survey 2020. UN. <https://doi.org/10.18356/8bdf045f-en>

Nawafleh, S., Obiedat, R., & Harfoushi, O. (2012). E-government between developed and developing countries. *International Journal of Advanced Corporate Learning (IJAC)*, 5(1), 8-13 DOI: <https://doi.org/10.3991/ijac.v5i1.1887>.

OECD, O. for E. C. and D. (2003). *The E-Government Imperative: OECD E-Government Studies*. <https://doi.org/10.1787/19901054>.

Salamah, A.A., Hassan, S., Aljaafreh, A., Zabadi, W.A., AlQuadah, M.A., Hayat, N., Al Mamun, A., & Kanesan, T. (2022). Customer retention through service quality and satisfaction: using hybrid SEM-neural network analysis approach. *Heliyon*, 8(9), e10570 DOI: <https://doi.org/10.1016/j.heliyon.2022.e10570>

UN E-Government Survey 2020. (n.d.). Retrieved March 21, 2021, from <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020>

United Nations E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development (With addendum on COVID-19 Response). (2020).

United Nations E-Government Survey | Multimedia Library - United Nations Department of Economic and Social Affairs. (n.d.). Retrieved March 21, 2022, from <https://www.un.org/development/desa/publications/publication/2022-united-nations-e-government-survey> <https://www.un-ilibrary.org/content/books/9789210051453/read>

Wirtz, B.W., Weyerer, J.C., & Geyer, C. (2019). Artificial intelligence and the public sector—applications and challenges. *International Journal of Public Administration*, 42(7), 596-615 <https://doi.org/10.1080/01900692.2018.1498103>.