The Implementation of Artificial Intelligence (AI) in the Egyptian Government

Challenges and Prospects

이집트 정부에서의 인공지능 구현

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Abstract

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Artificial intelligence—loosely defined as the incorporation of human intellect into machines—is a branch of computer science that develops ways for machines to perform tasks that would normally be impossible for humans.

In particular, we used the following definition in this research according to Haenlein & Kaplan, AI is "a system's ability to process data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation".

Applying artificial intelligence in Egypt is very important matter because of artificial intelligence, particularly that which is data-driven, such as machine learning, is expected to make a significant impact on economic and social systems. As stated in Egypt's national strategy for artificial intelligence, there is an

expectation of increasing the global economy by 15 trillion dollars by 2030, as well as nearly 25% GDP growth for countries that fully integrate AI into their economies.

The scope of this research is to investigate in depth the challenges that Egypt would face regarding the mechanism of applying AI in the government, and the convenient solutions to these challenges as well as the priority of these solutions based on Egypt's resources.

This research is a qualitative for a descriptive purpose, using a Delphi method in data collections based on a questionnaire, the participants for this questionnaire are from public sector and private sector who working on and /or teaching artificial intelligence.

After the literature reviews and data collections, the factors that could be challenges to the Egyptian government are data availability, technological infrastructure support for AI, awareness and knowledge of AI for people, the education system, and qualified human resources.

Egypt, on the other hand, is working to overcome some of these challenges, but they remain challenges for which no solutions have been found. This study provides some recommendations that may assist in dealing with these challenges.

Keywords: Artificial intelligence, AI challenges, government, public sector, Egypt.

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Chapter (1): Introduction

1.1. Study background

AI is a branch of computer science that focuses on the development of systems that can do activities that would normally need human intellect, it is loosely defined as the incorporation of human intellect into machines (Dermatologists, 2020).
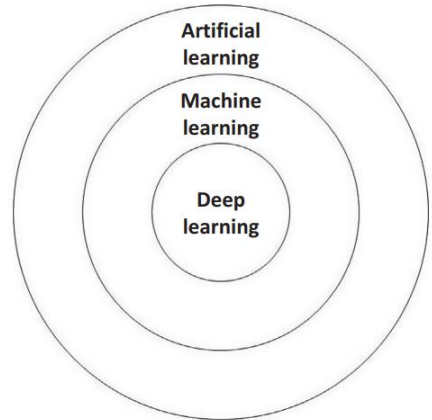
Figure 1: **the subsets of AI**

Source: Clinical and Experimental Dermatology Journal

AI machines perform tasks according to predefined rules and algorithms. AI is a catch-all term for any computer program that attempts to mimic human intelligence, including machine learning (ML) and deep learning (DL). ML is a part of AI that allows all methods in software to learn automatically from data. The use of data and methods to teach machines is what machine learning is all about (Dermatologists, 2020).

The machines learn how to make judgments by using the processed data and information. Machine learning (ML) is dynamic, which means that it may change as it is exposed to additional data. The 'learning' part of ML means that the ML algorithms try to decrease mistakes while increasing the chance of their predictions being correct (Dermatologists, 2020). In a brief, ML is a technique for realizing AI, (ML) is a method of designing intelligent systems whereby the system adjusts its behavior patterns based on data (Ried, 2019).

In recent decades, with the increasing availability of large databases and computing power, new AI methodologies based on data instead of algorithms have been developed. As a result, artificial intelligence (AI) has kept going to handle and interpret data at ever-increasing speeds, performing alike routine and non-routine tasks (Brynjolfsson & Mitchell, 2022).

AI is a multidisciplinary research topic that has recently gained significance in society, economics, and government, providing a variety of new opportunities. It is now impossible for nations to ignore the positive indicator of artificial intelligence and its impact on the existence of computer vision technologies that allow for real-time analysis and assimilation of videos and photos, as well as the presence of natural language processing algorithms that allow innovation robots to chat. Deep learning probabilistic is also utilized in complicated decision-making processes like medical diagnostics and a variety of other applications (Remy Kusters, 2020).

According to "Making AI Work for International Development Report", Artificial Intelligence is "using computers for automated decision-making that is meant to mimic human-like intelligence. Automated decisions might be directly implemented (e.g., in robotics) or suggested to a human decision-maker, the purpose is that some decision process is being automated. AI often incorporates machine learning (when using data-driven predictions to make better decisions)" (The AI & Development Working Group, 2019).

AI is currently one of the most important topics on the agendas of many countries around the world. The United States of America, China, and the most of the

European Union are all examples of countries that have already used artificial intelligence techniques to improve internal government operations, service delivery, and citizen contact, or have created a national AI policy. AI has the ability to transform several elements of government, including procedures, citizen involvement, service delivery, decision-making, and the creation and assessment of public policies (Cruz, J. , Almazán, & Gomezd, 2020).

In industries such as education and healthcare, artificial intelligence can help increase access, solve workforce shortages, and reduce risks and costs. However, particularly in countries with a large number of unemployed or low-skilled workers, the infrastructure and human potential required to leverage this technology are lacking. As a result, it is becoming increasingly concerned about artificial intelligence systems and the widening of technological, economic, and social divides (National Strategy for AI ,2021).

Moreover, Artificial Intelligence (AI) is being used by governments to deliver services and enhance operations, but its application to assist create policy is only getting started. The capacity to identify patterns of need, create evidence-based initiatives, anticipate results, and assess success falls firmly in AI's sweet spot. In the near run, AI will not replace policymakers, but it will enable a more comprehensive, quicker, and rigorous approach to govern. More broadly, AI has the potential to deliver on the promise of a future government that is more responsive and leaves no one behind (patel, et al., 2021).

On the other hand, AI signals the most significant labor-market shift since the industrial revolution and poses a threat to disadvantaged populations that were not sufficiently prepared for its appearance. Concerns about the ethics of AI systems are also growing, as are concerns about gender prejudice and inequality, insufficient regulation, and the loss of cultural and linguistic subtleties as a result of natural language processing. No country or actor possesses all of the solutions to these issues. As a result, international collaboration and broad-ranging discourse defined by multi-stakeholders are required to exchange information and practice guidelines, as well as to guide the development and application of artificial intelligence for the greater good (National Strategy for AI ,2021).

At the national level, nations must concentrate on establishing their own AI stances, leveraging their comparative advantages, and ensuring that the negative consequences of AI are avoided owing to its progressive technological underdevelopment (National Strategy for AI ,2021).

Based on the emerging technologies that emerged from the fourth industrial revolution, one of which is artificial intelligence, there are promising opportunities to be created in establishing the rules of a national economy that are based on the emerging technologies that emerged from the fourth industrial revolution.

According to that, Egypt is eager to interact with data in the digital era, where technological developments are occurring on a daily basis.

Egypt is keen on achieving progress on the UN's sustainable development goals (SDGs). The United Nations noted that the application of artificial intelligence

accelerates some of the sustainable development goals, such as Goal 4 "inclusive and equitable education", Goal 5 is about "gender equality", Goal 8 is about "inclusive and sustainable growth and decent work opportunities", Goal 9 is about "fostering innovation through inclusive and sustainable infrastructure", Goal 10 is about "reducing inequalities within and between countries", and Goal 11 is about "working toward sustainable and resilient cities and settlements" (National Strategy for AI ,2021).

This needed stepping up efforts to embrace these technologies and developing clear plans for how to profit from them in the construction of a modern, modern state and the achievement of Egypt's developmental development goals.

As a result, H.E President Abdel-Fattah El-Sisi, President of the Arab Republic of Egypt, has tasked the National Council for Artificial Intelligence with developing an integrated national plan with the goal of defining the characteristics of the road to localization of the Egypt's role in the AI industry should be strengthened at the regional level in order for Egypt to become an international participant in this field. (Ahramonline,2020).

According to a World Bank report on AI in the Public Sector, the government needs to develop an AI policy and governance framework to steer the ethical use of AI and provide clarification about AI principles and goals in order to control the challenges and maximize the potential of implementing AI in the public sector. Following the adoption of AI policy and the development of a roadmap, an

operating framework will be developed to stabilize the principles as AI is implemented (Artificial Intelligence in the public sector , 2020).

Artificial intelligence is becoming a greater challenge in the sociological study, given the precision and inventiveness afforded by computerized technology and intelligence methodologies. Based on machine learning methods connected to artificial intelligence, an overview of the sociological viewpoints of human behavior is more accurate. Artificial Intelligence applications in sociology may appear to be a conceptual contradiction, but this seemingly divisive approach produces excellent results (Birău & Birău, 2017).

1.2.   Purpose of Study

The scope of this research is to investigate in depth the challenges that Egypt would face regarding the mechanism of applying AI in the government, and the main factors that would affect applying AI are it could be the human who refuses the idea because they believe that AI will replace them, or it could be the data availability that AI system requires, as well as the quality of data, or it could be the natural language that AI uses, or it could be all of the previously mentioned factors or there will be more considerations.

As a consequence of these issues, the research will also explore the convenient solutions to the challenges that Egypt will encounter throughout the adoption of AI, including not only the convenient answers but also the priority of these solutions based on Egypt's resources.

1.3.   Research Questions

I.   What are the challenges that could face the Egyptian government in applying AI in the government?

II.   What are the proposed solutions for these challenges according to Egypt's resources?

III.   Is Egypt capable of turning these solutions from ideas into applications?

In this research, we aim to answer these questions through the analysis for twenty participants responses in AI field in public sector and private sector in Egypt using questionnaire method.

This research included private sector experts in the sample to avoid public experts' bias concerning the viability of applying artificial intelligence in the public sector.

Chapter (2): Status of AI in Egypt

The latest stage of Egypt's projects to diversify the country's economy focuses on fields such as artificial intelligence and analytics. Following on from the work done over the previous three years as part of its AI Egypt initiative.

2.1. Egypt in Numbers:

According to the government's AI readiness index 2020 report, which measures how prepared a country's government is to use artificial intelligence (AI) to provide public services to citizens using 33 indicators across ten dimensions, Egypt ranks as follows:
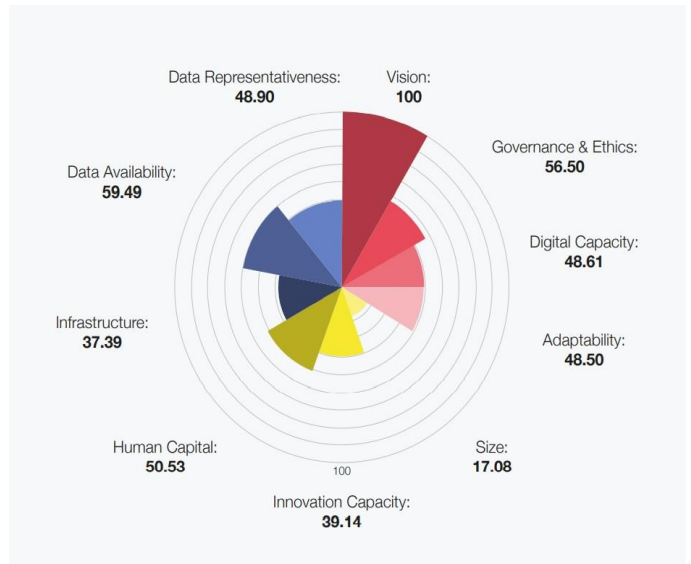
Figure 2: Egypt's scores in different measures

Source: AI readiness index 2020 report

Egypt's ranked 27 out of 34 in the responsible AI sub-index: this index reflects the growing interest in the field of responsible AI by measuring 9 indicators across four dimensions, these dimensions are inclusivity, accountability, transparency, and privacy, these dominions were selected to cover the OECD principles on AI, and the 9 measures are Income Inequality, Automation readiness index, Voice and accountability, freedom on the net, Corruption Perceptions Index,

Corporate Political Engagement Index, Rule of Law, Surveillance Industry Index and A.I. Surveillance Index (Government AI Readiness Index 2020, 2020).

Egypt's ranked 56 out of 172 in AI index globally and ranked 8 out of 18 regionally, in government index 31 out of 172 globally and 2 out of 18 regionally, in technology sector index 56 out of 172 globally and 7 out of 18 regionally, and in data and infrastructure index 117 out of 172 globally and 13 out of 18 regionally (Government AI Readiness Index 2020, 2020).

The Egyptian national strategy for artificial intelligence has four main pillars, the pillars are AI for government, AI for development, capacity building and international relations, these pillars are underpinned by four enablers: governance, data, ecosystem and infrastructure. as shows in Figure (3) below.
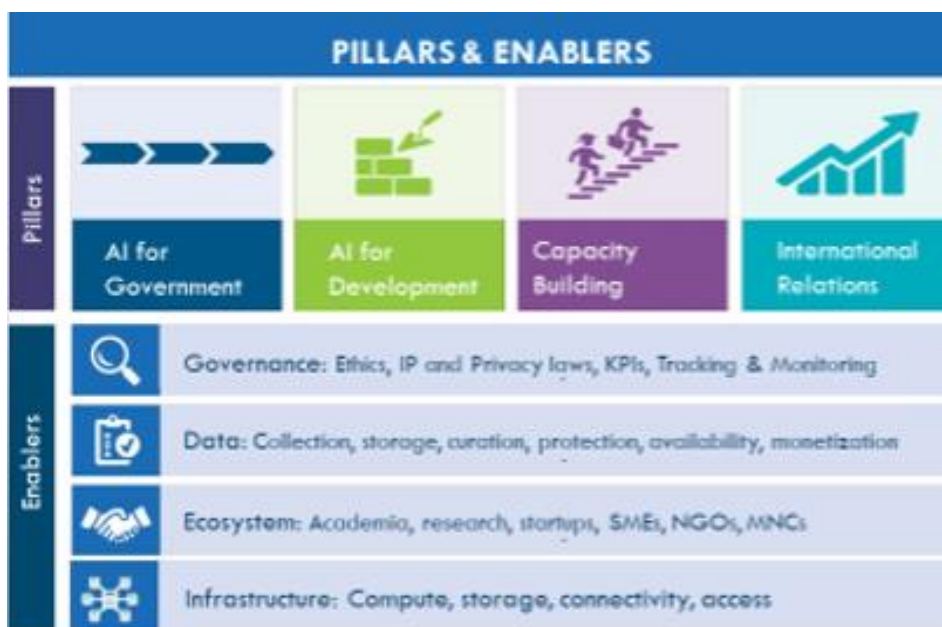
Figure 3*:* The four pillars and enablers of Egypt's AI strategy

Source (Radwan & Sobeih, 2021)

"AI for Government" this term is increasing efficiency and transparency through the automation of government operations and the integration of AI into the decision-making cycle (National Strategy for AI ,2021).

"AI for development" according to national strategy, Artificial intelligence is being used in various economic sectors with the goal of increasing efficiency, increasing economic growth, and improving competitiveness. Core projects will be identified and implemented over time through local and international collaborations, and will always have a capacity-building aspect to improve technology and knowledge transfer while also contributing to local environmental growth. Agriculture, environment, water management, health care, Arabic language processing, economic planning, economic development, industrialization, and smart infrastructure management are among the first phase's priorities (National Strategy for AI ,2021).

"Capacity building" this term explains the Egyptian preparation for the artificial intelligence era throughout all stages, from awareness creation to school and university and their equivalents, such as vocational training in technical and non-technical disciplines (National Strategy for AI ,2021).

"International activities" this term is about increasing Egypt's regional and international standing by promoting relevant initiatives, going to represent African and Arab positions, and effectively participating in international discussions concerning artificial intelligence (National Strategy for AI ,2021).

2.2. SWOT Analysis of AI in Egypt:

By doing SWOT analysis as addressed in (The Egyptian National Strategy for AI,2021) as shown in figure (4) below, Egypt's National Council for Artificial Intelligence assessed the country's current level of intelligence and readiness to embark on the path of adopting artificial intelligence.

Figure 4: A summary of Egypt's AI readiness SWOT analysis

Source (The Egyptian National Strategy for AI,2021)

There are three points for the strengths side for AI in Egypt represent in

First, researchers and engineers with AI expertise are hired by universities, research institutes, and industrial firms in Egypt. There are hundreds of AI researchers at the national research center, the academy of scientific research and technology, and the agriculture research center, among others.

Second, many Egyptian students choose to study ICT-related courses as undergraduates.

Third, because AI is linked to the governmental capabilities of computers and information, Egyptian youngsters are increasingly interested in studying ICT-related courses at the university level.

As mention in (The Egyptian National Strategy for AI,2021), the weaknesses that could face the Egyptian government when applying AI are:

"Inadequate AI Research and Education" according to the national strategy, there aren't enough specialists and qualified engineers who can create, install, maintain, and operate AI systems, pre-university education does not include AI training.

"Planning, management, social needs, and innovation in research" the national strategy explained that there is no dedicated governmental organization in charge of coordinating and/or integrating demand-driven AI research activities. There is a gap in the system that connects knowledge and innovation. The current legal system does not address the new difficulties that AI poses, such as ethical concerns, liability, and data bias.

"Data Availability and Quality" it was mentioned in the national strategy that data gathered by institutions for research purposes is not available. Many issues arise as a result of inadequate database integration, including duplication, data incoherence, and unreliability. All of these issues are unrelated to the extraction of accurate data.

"Universities and Institutes of Research Physical Infrastructure" the strategy discussed issues such as large data processing, insufficient Internet speed especially when it should be accessed separately. Universities and government-sponsored research institutes lack the computational capacity required in order to operate AI applications Insufficient knowledge of the value of property rights and how to protect it.

On the other hand, the opportunities that stated in (The Egyptian National Strategy for AI,2021) represented in many government issues may be solved using artificial intelligence and machine learning, such as extracting information from data, identifying and preventing security risks, detecting false news.

 In addition to various issues in many domains, such as health care, transportation, and agriculture, due to a lack of technical competence can be solved by knowledge-based systems

 Moreover, better methods are needed on a social and business levels for processing natural Arabic, Translation software, summarization, and semantic retrieval of information are a few examples.

And for the threats from applying AI in Egypt are as it mentioned in (The Egyptian National Strategy for AI,2021): due to restricting changes in open data rules, data availability has decreased, inability to keep talented local researchers who are lured to other nations by employers, Artificial intelligence applications have a negative influence on Egypt's workforce.

2.3. Pave the Path for the Applying of AI

According to the Ministry of Communications' report (MCIT, 2020), Egypt has taken significant measures in paving the way for the adoption of artificial intelligence in Egypt, including the following:

The National Telecom Regulatory Authority (NTRA) was established as the national authority competent to regulate and administer the telecommunications sector, and MCIT prioritizes the maintenance of strong, adaptive infrastructure; the development and convergence of technologies; and the protection of a regulatory framework encouraging both growth and investment in the ICT industry. NTRA seeks to improve and implement services in accordance with the most current technology while meeting the demands of consumers and considering disclosure, fair competition, public service, and customer rights protection. Since its founding, NTRA has endeavored to provide a safe, dependable, and accessible infrastructure. A lot of accomplishments were accomplished in 2020 to strengthen the telecommunications infrastructure, which helped to accelerate the digital transition (MCIT, 2020).

Telecom Egypt is a vital contributor to the national digital transformation since it continues to invest in the development of cutting-edge network infrastructure, which is a crucial enabler of the country's digitalization agenda (MCIT, 2020).

In 2020, Telecom Egypt has announced the construction of the largest global data center in Egypt, which has acquired design certification from the Uptime Organization and will get constructed facility and operational sustainability

certifications from the same institute. This will be the first facility to achieve all three certifications. It is made up of four data halls with a total capacity of 2,000 racks (MCIT, 2020).

With access to all worldwide submarine cable networks that arrive in Egypt, Telecom Egypt will be able to provide a comprehensive range of innovative solutions and advance to the application layer. In addition, the business has entered into a strategic partnership with AMS-IX to construct an Internet exchange within this facility, which will function as an open-access data center for big content delivery network providers, application providers, cloud providers, and telecom carriers. Telecom Egypt presently operates seven data center facilities, with additional ones planned in other critical areas (MCIT, 2020).

Establishing a center known as the AI Center of Excellence (CoE). This center will be the engine for planning and building AI solutions for a wide range of issues confronting the country, as well as employing qualified and experienced AI researchers with advanced degrees (MCIT, 2020).

It should be noted that MCIT has initiated a number of big initiatives to increase Egypt's fixed broadband quality. Over the last two years, USD 1.6 billion has been invested in developing the ICT infrastructure, resulting in a higher average Internet speed of 34.9 Mbps in December 2020, indicating that the Internet speed has doubled six times compared to January 2019, ranking Egypt fourth in Africa in fixed Internet speed. The second phase of the project began in the second half of 2020, at a cost of more than USD 400 million (MCIT, 2020).

Moreover, MCIT Completed linkage of more than 75 government databases together in collaboration with the Administrative Control Authority as part of the implementation of the Egyptian state's national project for information infrastructure, which aims to improve the comprehensive vision of planning and address database duplication; This project is the main pillar on which Egypt's digital applications are based (MCIT, 2020).

The Center for Applied Innovation has been established, which collaborates with research institutes, academic institutions, and international companies to develop innovative solutions to society's challenges using modern ICT technologies; in its first phase, it prioritizes health care, agriculture, dealing with water scarcity, Arabic language treatment, and machine translation, with the goal of establishing Egypt's leadership in this field (MCIT, 2020).

Egypt formed and chairs the African Artificial Intelligence Working Group in order to unite efforts in its operations among African Union member states, as well as an Arab Artificial Intelligence Working Group in charge of formulating a cohesive Arab policy. The first international document on artificial intelligence ethics (MCIT, 2020).

Egypt is one of only two countries chosen to participate as an observer in the Global Partnership on Artificial Intelligence (GPAI). GPAI is a multi-stakeholder initiative that supports cutting-edge research and applied activities on AI-related priorities in order to bridge the gap between theory and practice in AI (MCIT, 2020).

On the other hand, President Abdel-Fattah El-Sisi, President of the Republic, launched the idea of establishing the College of Artificial Intelligence in 2019 during the Youth Conference in Sharm El-Sheikh, and the first response was to establish the College of Artificial Intelligence in Kafr El-Sheikh (MPED, 2020).

The idea has won the approval of a large number of universities, such as the universities of "Cairo, Tanta, Helwan, Zagazig, Damanhour, Banha, Luxor, and Menoufia."

Since 2019, the Faculty of Artificial Intelligence at Kafr El-Sheikh University has become the Middle East's first artificial intelligence faculty (Faculty of AI - Kafr el sheikh University, 2022.)

The faculties of artificial intelligence are divided into four major departments: "machine programming and information retrieval, robotics and smart machines, embedded network system technology, and data science." There are several programs in various faculties, such as "Bioinformatics" and "Medical Information."

Chapter (3): Literature Reviews

3.1. Challenges of Applying AI:

According to the report Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development (Chakroun, Holmes, Mendes, West, & Casado, 2019), there are six difficulties that have to be clarified in international and domestic discussions about the difficulties and challenges of implementing AI.

The first challenge is to create a comprehensive vision of policymaking on artificial intelligence for long-term development. The complexities of the technological conditions required for development in this sector necessitate the collaboration of multiple elements and institutions. International and national policymakers must work together to create an AI ecosystem that promotes sustainable development.

The second challenge is working to ensure AI participation and equity in education. With the progress of artificial intelligence, low-income countries are at risk of experiencing new technological, economic, and societal divisions. Some significant obstacles, like essential technological infrastructure, should be overcome in order to lay the groundwork for the adoption of technology techniques that use AI to improve learning.

The third challenge is that the initiative is intended to prepare teachers for an AI-powered education while also preparing AI to understand education. However, there is a two-way street: teachers must learn new digital skills to be able to use AI meaningfully as a teacher, and AI developers must gain a better understanding of

teachers' practices so that they can create solutions that work in real-life environments.

The fourth challenge is to develop data systems that are accurate as well as inclusive. Data quality should be our top priority since we are progressing to data-based education. It is critical to build state capacity in order to improve data collection and systematization. AI advancements should allow for a greater emphasis on the importance of data in educational system administration.

The fifth challenge is about AI research in education has to be meaningful. There is no doubt that the field of artificial intelligence in education will continue to expand in the future, but it is important to remember that the educational sector has struggled to take stock of educational research in a meaningful manner both for practice and policy.

The sixth challenge is about ethics and transparency in data collection, use, and distribution. Access to the educational system, personal information, ability to focus, responsibility, influence on work, data privacy, and ownership of data feeding algorithms are all ethical issues that AI raises. As a result, AI legislation will necessitate a public discussion of issues such as ethics, accountability, transparency, and security.

Besides these factors, there are other challenges to adopting and implementing AI in the public sector. For example, AI algorithms can introduce inadvertent bias, reinforce historical discrimination, favor a particular political orientation, or reinforce undesired practices (Kankanhalli, Charalabidis, & Mellouli, 2019).

Add to the above mentioned, utilizing resources such as AI voice robots to create value by improving public service performance, for example, offering new services, providing new service channels, and lowering costs is a significant challenge faced by governments at all levels around the world (Wang, Teo, & Janssen, 2021).

3.2. Opportunities of AI for the public sector

As mention in (Artificial Intelligence in the Public Sector Maximizing Opportunities, Managing Risks, 2020) report that published on (World Bank, 2020), The opportunities for applying AI in the public sector are represented in the following points

Participation Of Citizens, according to the world bank report, the introduction of artificial intelligence tools such as chatbots to address citizen questions. For instance, if they asked about the ballot or the nearest emergency hospital, or even if they asked about the social security benefit, consolidation and pattern validation could also be used to collect feedback from millions of people on a proposed rule that has been made public online (World Bank, 2020).

Risk Management and Compliance, this term was clarified in the world bank report as, in order to provide non-compliance alerts, artificial intelligence technologies are used to pass and reconcile terabytes of datasets. Financial intelligence entities and financial institutions, for example, use AI to detect

illegal cash movement and advantageous ownership, as well as terrorist attack funding, in order to comply with the Financial Action Task Force. The tax departments can use artificial intelligence to track down tax filers who use multiple accounts to avoid taxation (World Bank, 2020).

Fraud Detection, Prevention, and Investigation, artificial intelligence, which is closely related to compliance, may be used by procurement agencies, anti-corruption units, or audit agencies, for example, to detect and prevent fraud (World Bank, 2020).

Business Process Mechanization, websites can be scanned by AI automation systems to obtain currency exchange rates and other information (World Bank, 2020).

Delivery of Personalized Services, artificial intelligence delivers automatic alerts based on a profile, for example, when should a driver's license be renewed (World Bank, 2020).

Asset Management, artificial intelligence may be used to track asset movements across many platforms while also gathering data from Internet of Things devices (World Bank, 2020).

Decision-Making and Analytics, in the context of artificial intelligence or machine learning, a wide range of data can be aggregated and cross-referenced to produce policy insights and identify areas that require targeted

policy interventions, such as household survey data and school enrollment information, address changes, and satellite images of floods, mosquito swamps, and pandemics (World Bank, 2020).

3.3. The importance of AI in the government

The government sector is undergoing considerable transformations at the moment, Processes are becoming digitized, allowing expenses to be decreased and activities to be accomplished more quickly and easily, regardless of time or site (Digital by default: A guide to transforming government, 2016).

Moreover, AI has enormous potential in the areas of public sector governance and discretion, such as reducing discretion, increasing monitoring efficiency, and improving democratic policies (Wang, Teo, & Janssen, 2021).

In the same regard, AI provides the extension of human capacities to manage complicated operations such as AI fraud detection to safeguard government data. The analysis utilized in contact tracing during the COVID 19 epidemic is a fairly recent example of supplementing AI-based public service support (Kuziemski & Misuraca, 2020).

AI refers to a collection of technologies that allow computers to replicate human intellect. Speech recognition, such as commanding virtual assistants

to complete tasks, picture recognition for identification, and autonomous driving are all examples of AI. AI also makes augmented analytics tools more powerful and accessible, allowing you to study and analyze vast amounts of unstructured data to acquire a better understanding of the numerous aspects driving your organization. We may say that big data is the fuel that propels AI decision-making forward, AI development and implementation would most likely boost citizen happiness, facilitate connectedness and engagement, and reduce administrative responsibilities (How Big Data and AI Work Together, 2022).

Nevertheless, the public sector confronts various dangers related to AI deployment, including "potential employment losses, damage causation, lack of transparency, loss of privacy and personal liberty, potential information biases, and mistake proneness (Kuziemski & Misuraca, 2020).

3.4. Factors affecting the implementation of AI

There are six general factors to consider when preparing the world, regulatory agencies, and the community for the AI revolution. About how being conscious of these updates can help institutions anticipate and prepare for them.as show in (Figure 5) below (Kaplan & Haenlein, 2020).

"Enforcement: Law and order" (Kaplan & Haenlein, 2020) this term explain that the legislation appears to focus on the method used to produce AI rather than on AI itself, requiring order and control to reach its full potential. In this regard, there are

common rules for collecting, processing, and storing personal data, along with guidelines and processes for evaluating algorithms and ensuring their transparency. There will be a need for regulatory guidance to prevent undue concentration in the AI field, as doing so may have significant and costly consequences if done incorrectly or with to narrow a scope. Furthermore, organizations must be mindful of the national environment in which they operate, since standards and present and future rules differ significantly from one country to the next.

"Employment: Humans and machines" (Kaplan & Haenlein, 2020) this is about even though significant job losses as a result of AI are unlikely, some industries will undoubtedly be impacted. Low-wage workers and office workers will be affected by AI in the same way that shop-floor automation did decades ago for physical workers. Governments may choose to keep people in jobs by requiring corporations to reduce their use of automation, train employees for new responsibilities, restructure overall team working days, or outright prohibit automation.

Regardless of whether or not AI is legitimate, managers must be aware that many employees are worried about being replaced. In order to accomplish this, leaders need to be able to communicate openly, resolve conflicts, and lead in an ethical, open, and transparent manner. As a second step, managers must recognize the abilities of their human employees and develop a coexistence ecosystem where robots and people will live together. A higher emphasis will be placed on jobs with an emotional component or requiring feelings, which gives humans an inherent advantage over technology.

Third, rather than using a top-down strategy, all of this should be done from the ground up. Employees perform better when they participate in the implementation and development of Ai technologies. Managers will have to be both supportive role models and content decision-makers.

"Ethics: Values and instincts" (Kaplan & Haenlein, 2020) artificial intelligence is a method that tries to complete any task that is assigned to it. The problem arises when those instructions are given by people who are just not as precise as they ought to be. AI systems must understand human values in order to read ambiguous commands successfully.

It will also be critical to instill values and ethical principles in AI systems, as the increased use of AI will make the company's existing regulations and behaviors extra clear to the outside world. An AI system trained on erroneous or biased data would formalize and exacerbate these errors. If the organization previously had a slight bias toward hiring a select population of people applying, the AI system will completely eliminate that bias.

Artificial intelligence systems should only be released after thorough testing, similar to how pharmaceutical firms perform extensive testing before releasing new products. It's best if an AI system is as transparent as possible. It may be necessary to extract rules that can be communicated to users and other stakeholders after the fact to make these same internal workings of AI systems less ambiguous.

"Education: Science and humanities" (Kaplan & Haenlein, 2020) in an AI-driven world, proper human education will be critical. Human employees will have to

realize that machines will make up a portion of their coworkers in the future, in some form or another. As a result, everyone should learn a programming language and have a fundamental grasp of programming.

This implies they'll need to be taught more nuanced abilities because humans will most likely continue to outperform AI in this area. To prevent businesses and society from becoming overly reliant on technology, the human aspect and an ethical approach to its application will become increasingly important. As a result, some propose that colleges should provide courses on AI and humans to address issues such as equality, ethics, and privacy.

This type of training should not be restricted to institutions, but should also be implemented in organizations. Because there is no assurance that trained staff will stay with the organization in the future, organizations often view such training as a burden. However, this is an incorrect viewpoint. Employees who can operate in an AI-enabled environment are in high demand, and intensive training is an investment not just in developing such abilities but in attracting new employees and retaining current ones.

"Entente: Cooperation and stability" (Kaplan & Haenlein, 2020) regulation in the AI sector is complicated and will require at least some form of international coordination and diplomacy to avoid the use of AI in war, terrorism, or tax evasion. Numerous global firms have reported recommendations on the matter in the past. For example, it has been proposed by Human Rights Watch and the United Nations that AI-driven weaponry be prohibited. By hosting AI-powered servers abroad,

companies will be able to relocate the center of value creation to wherever they wish, allowing them to avoid taxes.

The EU is considering imposing a 3% tax on earnings earned within its borders since these decreases company profits are arbitrarily reduced, for example, as a result of the payment of fictitious royalty fees. The OECD has also suggested adopting international AI standards to avoid the two AI giants, China and the United States, imposing de facto regulations.

"Evolution: Pace and IQ" (Kaplan & Haenlein, 2020) at first, laws will likely focus on fostering innovation, but as time goes on, they will place a greater emphasis on privacy concerns and market concentration difficulties. certain activities will become increasingly automated, humans are expected to evolve new and distinct forms of intellect in response to AI's growing dominance. They also have a proclivity to improve one's intelligence over time. Patients with Torsion Dystonia have been shown to have a ten-point advantage in intelligence. over the ordinary individual. Our natural desire to be lethargic may really be a benefit since it permits us to come up with creative and efficient solutions.

Organizational structures may need to be flexible in order to accommodate variable shares of people rather than robots and make modifications to job allocation among them.

AI may primarily assist in making existing processes quicker and more efficient, but processes may eventually need to be completely reinvented. A significant challenge

for any manager will be to avoid missing this critical moment while also considering the human side of AI and teams.
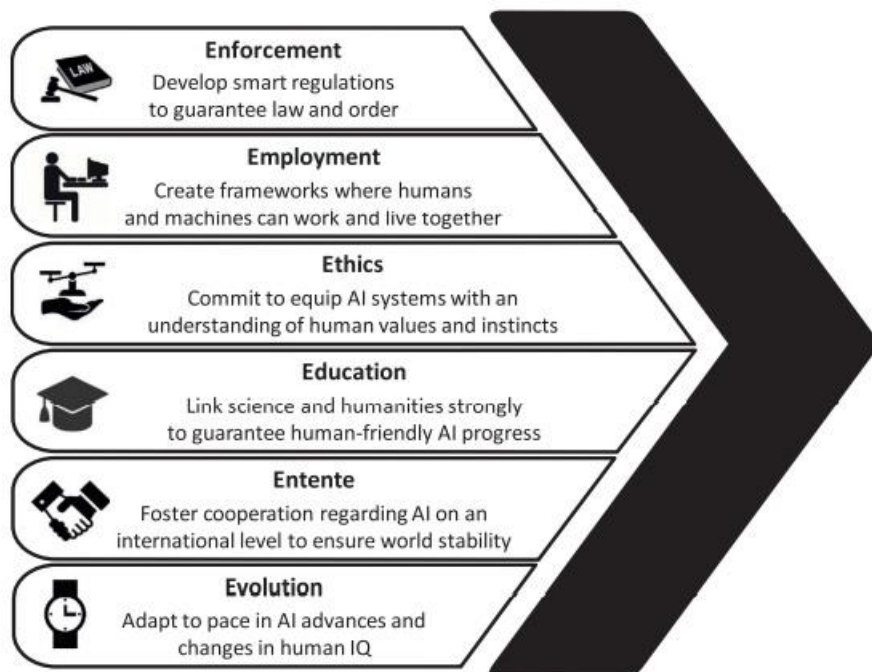
Figure 5: Six directions for AI to unite the rulers of the world

Source (Kaplan & Haenlein, 2020).

According to the OECD, raising general knowledge and awareness about AI could be one of the factors influencing AI because, in order to reap the benefits of AI, the general public must be educated and a base of educated, knowledgeable users must be established. This is what will eventually produce the technical professionals and highly skilled specialists Egypt requires to implement and expand its ambitious artificial intelligence plans.

Raising public awareness of AI, its applications, benefits, risks, and limitations, has been identified as a gap not only in Egypt but throughout the world. The use of the

term intelligence in relation to what are essentially Machine Learning applications has caused considerable consternation, not to mention the public uncertainty and fear created by science fiction books and films (Radwan & Sobeih, 2021).

3.5. The Distinction Between the Public and Private Sectors in Terms of AI Application

The difference between the public and private sectors in using AI, according to existing research, is the goal of using AI (Wang, Liu, & Fang, 2019), While the private sector aims to make a profit and create private value (economically), the public sector aims to create public value. The public value should not be evaluated through the lens of individual consumers' economic markets, but rather through the lens of citizens' political will and the collective decision-making of representative democratic institutions. Citizens place value in three areas: services, outcomes, and trust.

This categorization is a useful way to think about the aspects of public value: fixing internal issues at the management level represents services, making public value at the public level represents outcomes, and working to improve citizen-government communication at the political level represents trust.

In terms of the volume of academic publications, the level of investment, and regulatory interest, and as (Wirtz, Langer, & Fenner, 2021) mention artificial intelligence (AI) is experiencing one of its peak hypes at the moment. The family of cognitive technologies includes computer vision, machine learning, natural language processing, and robotics. The haste to grasp new socioeconomic

circumstances generated by the widespread deployment of AI is warranted by its far-reaching repercussions, which touch practically every aspect of life, from labor markets to human rights protection to healthcare. However, the public sector is caught in a fatal double-bind: its responsibility to safeguard citizens from possible algorithmic harms clash with the drive to boost its own efficiency - or, to put it another way, to regulate algorithms while being governed by algorithms.

Data intelligence and big data imply a resource-generating capability for public-sector decision-making through the use of artificial intelligence and big data, which can take two forms: obtained and current resources that have been developed and maintained in the long run. As a result, after adhering to customary behaviors for a lengthy period of time, individuals appear to take the validity of these activities for granted and do not question their efficacy (Vaio, Hassan, & Alavoine, 2022).

As (Kuziemski & Misuraca, 2020) mention, Implementation of AI in government processes and actual processes seems to have the potential to supply enormous advantages to organizations and citizens in terms of continuous improvement of policymaking and service delivery, ultimately increasing their trust and satisfaction in the reliability of government services. Nevertheless, the role of the government as a user of AI technology has received far less attention in the current tactics than the role of the regulator.

The successful deployment of AI in the public sector faces a number of challenges, some of which are generic and others of which are context-specific. To begin with,

while governments have pursued numerous digitization paths, many people are imprisoned by the sunk costs of obsolete IT systems.

Recent research, on the other hand, provided a useful three-level categorization of impediments to the growth of machine learning in the public sector (Kuziemski & Misuraca, 2020).

First, new cross-cutting individual rights and responsibilities must be established at the macro level. These must be accompanied by the upskilling of bureaucrats, who must now be able to thoroughly analyze the intended and unintended consequences of AI in terms of public principles like accuracy, justice, transparency, and equity.

Second, the progression of more energetic methods of measuring, monitoring, and evaluating the inputs, processing information, outputs, outcomes, and effects of public programs using machine learning is required at the meso level, which challenges established measures of public sector performance, quality, and risk assessment.

Third, at the micro-level, addressing the emergence of new conflicts between the legitimacy of algorithmic decisions is required for the frontline delivery of services; the power to make decisions by street-level bureaucrats when applying, evaluating, or addressing appropriate decisions; and the privileges of user data when these processes are used to notify the distribution of public goods and services.

According to studies, firms that use an information-based decision-making method are five percent more successful and gain six percent more revenue than their competitors in the private sector. In the meantime, there is no comparable indicator

in the public sector. Without a doubt, the efficient routine has not resulted in the ability to use data to drive change in the public sector.

3.6. AI Techniques and Government Functions

(Sousa, Melo, Bermejo, Farias, & Gomes, 2019) suggested a frame work for AI solutions for public sector as it shown in figuer 6 below, they classify the government function as follow, F1 reffers to general public service,F2 refers to public order and safty, F3 refers to defence, F4 refers to economic affairs, F5 refers to environmental protection, F6 refers to housing and community amenities, F7 refers to health, F8 refers to recreation , culture and religion, F9 refers to education, F10 refers to social protection.

For AI techiques, they presented eight techiqued, Artificail Neural Network(ANN), Case -Based Reasoning (CBR), Cognitive Mapping (CM), Fuzzy Logic (FL), Machin Learning (ML), Multi – agent systems (MAS), Neural Languagues Processing (NLP), and Genetic Algorithm (GA).

ML encompasses a number of techniques aimed at the processing and analysis of large amounts of problem-solving data, with ANN being one of the most important, Artificial adaptive systems (ANN) are artificial adaptive systems that are inspired by the functioning processes of the human brain.

The width of the data that provides functions of government in Figure 6 reflects how the functions are benefited by AI. For instance, general public service is the most beneficial function of AI, and the width of the data that provides AI techniques

reflects how regularly the techniques have been used in the public sector. For instance, ANN is the most commonly used AI technique.

In order to better understand Figure 6, from top to bottom, the development of AI alternatives in the public sector starts with requirements generated by government functions, such as societal requirements and needs, as well as internal government processes. The framework's heart is made up of AI solutions for the public sector, each of which can be used by one or more functions. The framework's foundation is built on AI techniques, which then provide the software resources needed to develop solutions.
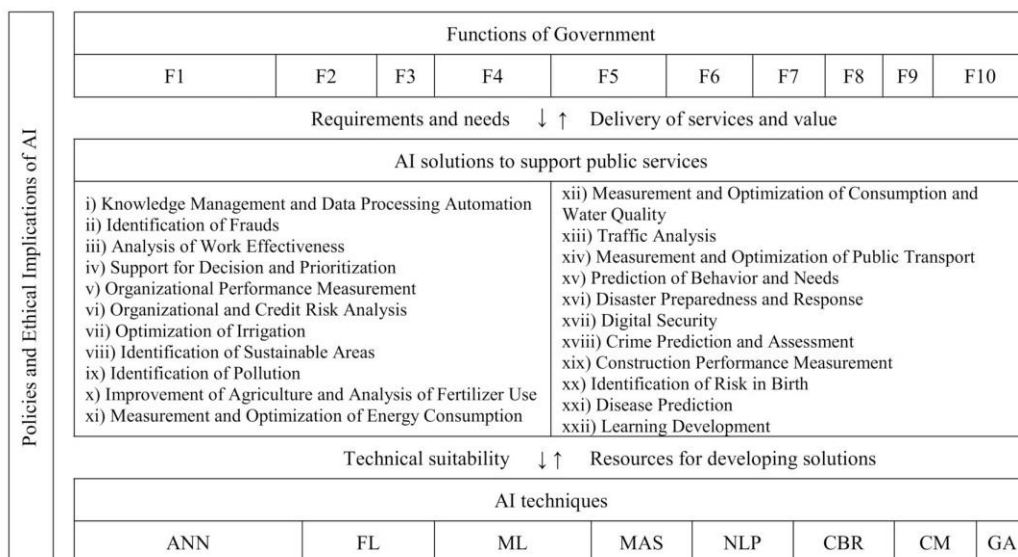
Functions of Government									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Requirements and needs ↓ ↑ Delivery of services and value

AI solutions to support public services
i) Knowledge Management and Data Processing Automation / ii) Identification of Frauds / iii) Analysis of Work Effectiveness / iv) Support for Decision and Prioritization / v) Organizational Performance Measurement / vi) Organizational and Credit Risk Analysis / vii) Optimization of Irrigation / viii) Identification of Sustainable Areas / ix) Identification of Pollution / x) Improvement of Agriculture and Analysis of Fertilizer Use / xi) Measurement and Optimization of Energy Consumption   xii) Measurement and Optimization of Consumption and Water Quality / xiii) Traffic Analysis / xiv) Measurement and Optimization of Public Transport / xv) Prediction of Behavior and Needs / xvi) Disaster Preparedness and Response / xvii) Digital Security / xviii) Crime Prediction and Assessment / xix) Construction Performance Measurement / xx) Identification of Risk in Birth / xxi) Disease Prediction / xxii) Learning Development

Technical suitability ↓ ↑ Resources for developing solutions

AI techniques							
ANN	FL	ML	MAS	NLP	CBR	CM	GA

(Left vertical label: Policies and Ethical Implications of AI)

Figure 6: Function of Government & AI Techniques

Source (Sousa, Melo, Bermejo, Farias, & Gomes, 2019)

3.7. Theoretical Model for Challenges to AI in Public Sector

Based on the causation and effect relationship, and to build the conceptual model illustrated in figure (7), the cause components to construct a feasible model for AI application in the public sector for future validation. these causal factors such as data quality, qualified personnel, access limits to specific data, managers' lack of awareness of cognitive technologies, and difficulties in integrating cognitive initiatives were mapped, these characteristics back up prior studies into the challenges of using AI in the public sector (Sharma, Sunil, Joshi, & Kumar, 2021).

Major problems noted in (Sharma, Sunil, Joshi, & Kumar, 2021) study, include a lack of managerial awareness of cognitive technologies, poor data quality, difficulty integrating cognitive initiatives with existing processes and systems, and cost concerns. These issues must be addressed in order to accelerate the adoption of AI technology. Organizations in the public sector must develop, train, and expand their workforce's knowledge base.

The essential requirements for AI application are improved data quality and integration among main players. Because AI has changed the environment, government officials should focus on areas where AI can provide widespread, visible, and immediate good outcomes.

For cost savings and increased efficiency, all parties must engage in improving current resources and procedures. To fully realize the promise of AI in government, the government must design a holistic plan that includes AI as well as other emerging technologies like machine learning and the Internet of Things
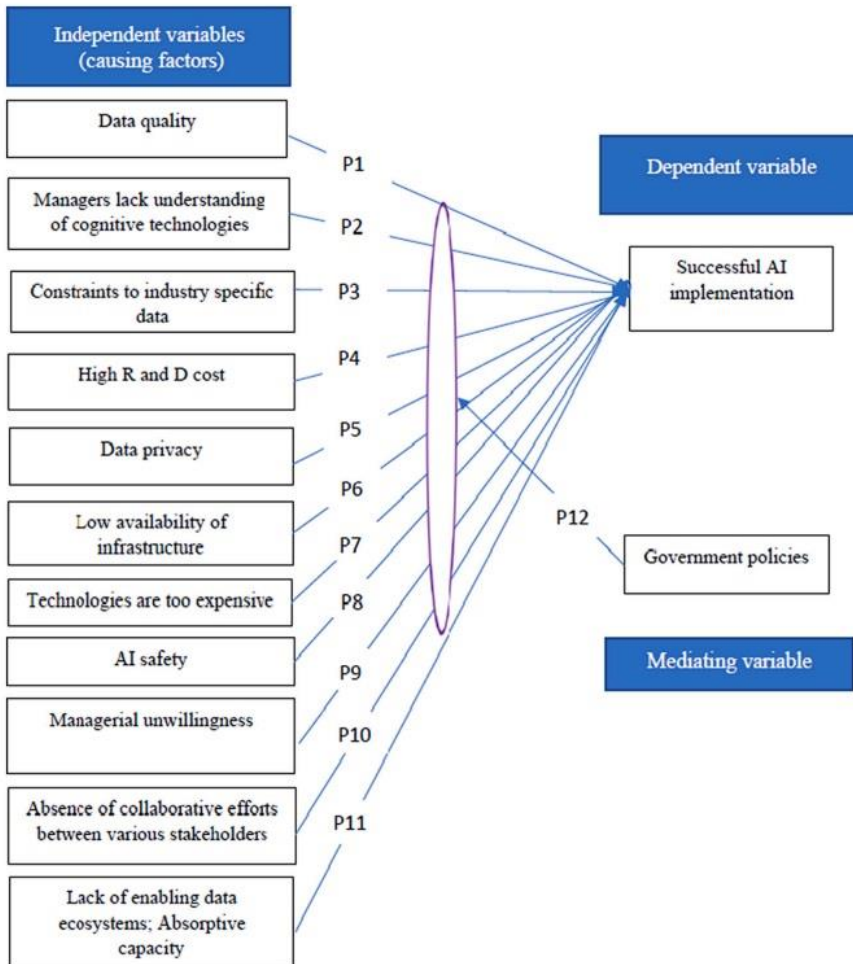
Figure 7: AI theoretical framework

Source (Sharma, Sunil, Joshi, & Kumar, 2021)

3.8. Institutional & Regulatory Theories for AI

As (Li, Liu , Zhou & Yao, 2021) stated in their article, In information systems research, institutional theory has been widely used. IT adoption is the most frequently applied area for institutional theory, which has been used to explain the adoption behavior of interorganizational information systems, grid computing, e-

government, and open government data, among other things. IT security is the second most common application of institutional theory. Institutional theory, for example, has been used to explain the behavior of information system security innovations, organizational actions to improve information system security, and data security policy compliance. Furthermore, institutional theory has been applied in the contexts of knowledge sharing and IT strategy.

They also mentioned that institutions have three pillars: the regulative dimension, the normative dimension, and the cognitive dimension. The regulative dimension of institutional theory is represented by laws, regulations, and contracts, as well as their enforcement through mediation, arbitration, or litigation. The basis of the regulative dimension's legitimacy is legally sanctioned. Institutional theory's normative dimension corresponds to socially shared expectations of appropriate behavior and social exchange processes. The normative dimension's legitimacy is governed by moral principles. The cognitive dimension of institutional theory corresponds to conceptual beliefs and mental models, scripts, or conceptual frameworks used to bridge values or interest differences. The cognitive dimension's legitimacy is conceptually correct.

According to (Larsen, 2021) The concept of institutional infrastructure in organization theory reflects an understanding of how organizations are embedded within fields and how fields are structured through interactions and institutional activity among actors. Organizational fields have become more dynamic over the last few decades, and boundaries between fields have become more porous as new

digital infrastructures, such as the Internet, have been introduced. And based on the institutional logic, a field is defined by its as its "socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules." An institutional logic perspective examines the interaction between individuals, organizations, and institutions.

on the other hand, institutional work highlights a conceptual shift toward individuals' and organizations' actions being based on cognitive, not emotive, processes and structures, and thus proposes an approach that concentrates on how stakeholders socially construct rules, scripts, schemas, and cultural accounts (Larsen, 2021).

In this context, AI systems are important in the digital transformation of government. By promoting a stronger connection between governments and citizens, anticipating demands, automating routines, and performing discretionary functions, AI systems have the potential to change the institutional performance of public services and public policies. Adopting AI systems entails employing technology that can learn to make decisions and solve problems (Filgueiras, 2020).

To improve their predictive capabilities, AI systems rely on massive amounts of data. This means that the ability of a government to collect, store, process, and share data across its various organizations is critical to implementing AI systems in public administration. A data governance authority is required to protect citizens' privacy, ensure safe data use, and provide resources for AI systems to function. The ability to gather, store, process, and share data is required. Data governance necessitates

the creation of regulatory mechanisms capable of guiding data ownership policies while also protecting citizens and facilitating technological advancement (Filgueiras, 2020).

Institutional theory in the social sciences has the potential to improve AI system adoption and policy by analyzing AI design problems and institutional relationships (Filgueiras, 2020).

Add to that, as (Wirtz, Weyerer, & Sturm) stated in their article, governance aims to enable institutions, society, and other stakeholders to collaborate and reach policy goals in a dynamic and changing environment without causing major disruptions or damages. AI's disruption and negative effects may be viewed from a political and economic perspective as a failure of the market. Market failure occurs when resources are not allocated efficiently and all stakeholders' costs and opportunities are not considered. This is a crucial concept in regulatory theory. To improve the regulatory process, the actors involved should work together to represent the knowledge and expertise of all interested parties. As a result, the various actors in this policy-making process, as well as their collaboration, may play an important role in the context of regulation (Wirtz, Weyerer, & Sturm, The Dark Sides of Artificial Intelligence: An Integrated AI Governance Framework for Public Administration, 2020).

Chapter (4): Research Methodology

4.1. Research Framework

After the literature review, and after looking the status of AI in Egypt, there are four independent variables and one dependent variable make up the proposed framework for the challenges facing AI applications in Egypt. The independent variables are: data accessibility, education system, technology infrastructure, and qualified human resources, and the dependent variable is AI.
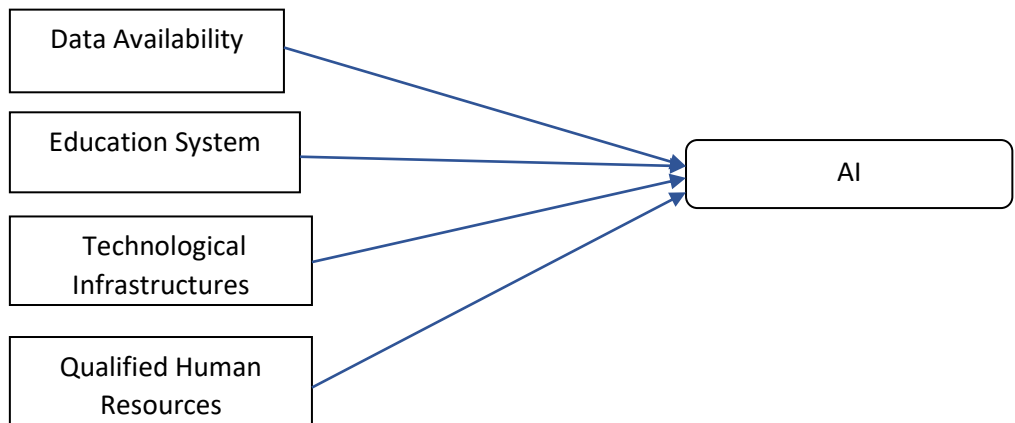

Figure 8: The Proposed research framework of Challenges Factors for Applying AI

4.2. Definitions of Variables:

AI: "is a system's ability to process data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Haenlein & Kaplan, 2019) It is a Dependent Variable.

Data Availability: "is the process of ensuring that data is available to end users and applications, when and where they need it. It defines the degree or extent to which data is readily usable along with the necessary IT and management procedures,

tools and technologies required to enable, manage and continue to make data available" (Data Availability, 2017). It is an Independent Variable.

It is considered a challenge because the accurate data required for research purposes is unavailable. Furthermore, poor database integration leads to a slew of problems, such as data duplication, lack of accuracy, and inconsistency, all of which make it difficult to identify and generate valuable information.

Education System: "Is the socially organized and regulated process of continuous transference of socially significant experience from previous to following generations. The main way to receive an education is to take a course of training in the system of educational institutions" (Naziev, 2017). It is an Independent Variable.

It is considered a challenge because Egypt does not provide knowledge about AI unless at the information technology collages, so there is a little few youths who have knowledge about AI.

Technological Infrastructures: "Refers to the composite hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment" (IT Infrastructure, 2020). It is an Independent Variable.

It is considered a challenge because big data requires a lot of bandwidth on the internet, especially when it needs to be handled remotely and Egypt suffers from low average internet speed and deteriorating service quality.

Qualified Human Resources: "A special skill or type of experience or knowledge that makes someone suitable to do a particular job or activity" (Human Recourse Management Practice, 2021). It is an Independent Variable, it is considered a challenge because there aren't enough specialists and competent engineers who can build, install, maintain, and operate AI systems.

4.3. Research Design

The paradigm is qualitative for a descriptive purpose due to depending on models, it is used to describe the main features to give an overall sense of the data being analyzed using the frequency analyses.

4.3.1. Research Method

Delphi method used to collect data because the Delphi procedure seeks to identify the extent to which experts or laypeople agree on a particular subject and with each other, as well as to reach a consensus view in areas where they differ (TWIN, 2021).

4.3.2. Process of Research Method

4.3.2.1. Pilot Survey

A pilot survey is a questionnaire-based survey that collects a small sample of respondents. This pilot survey's goal is to forecast response patterns while also evaluating research instruments such as questions, survey formats, and dissemination methods. Using a convenient sample can assist in identifying any

issues that may affect the primary data collection process and then making any necessary changes to the research (Formplus, 2021).

4.3.2.1.1. Pilot Survey Results:

The target sample was the Egyptian students who studies master degree in Korea and official Egyptian employees in middle managerial level in different ministries in Egypt.

The pilot survey divided in to two parts, the first part was about the questions related to this topic research, and the second part was related to evaluate the questions and structure of the survey.

The results of the first part of this survey concluded that the main challenge that could face the Arab Republic of Egypt is IT infrastructure followed by the lack of experience in implementation because of unqualified human resources, the weak education system in AI learning, data availability, and data security issues.

The results of the second part of this survey concluded that the questions were easy to understand but the structure of the survey preferably increase multi-choice questions more than open-ended questions and this suggestion will be considered in the main questionnaire.

4.3.2.2. Questionnaire

The Delphi method is typically used with questionnaires, whereas focus groups are designed to create debate on a certain issue, the steps below describe how to conduct a Delphi study:

1. Create the questionnaire

2. Invite individuals to participate

3. Distribute the first round of questionnaire

4. Analyze the replies to the first batch of questionnaires.

5. Create the questionnaire for the second round.

6. Distribute the second round of questionnaires

7. Analyze the replies to the second round of the questionnaire for agreement and degree of consensus.

8. Summarize your results.

4.4. Data Collection

A questionnaire was used to collect data from twenty people, whether they worked in the private or public sector or taught AI at private and governmental universities.

Their responses are based on the tangible reality of their jobs and workplaces, with some of them working on AI files in various ministries, others as professors at Kafr El-Sheikh University, Egypt's first college to teach AI, and others as consultants in the managerial field.

This questionnaire's sample includes both the private and public sectors in Egypt in order to avoid biased opinions, whether positive or negative, about the implementation of AI in government.

As previously mentioned, the questionnaire was divided into three rounds, with the first round's questions focusing on the points listed below.

1. What challenges might Egypt face if AI is applied to the government?

2. What is the difficult part of AI for Egypt?

   [data availability – algorithms - natural language processing].

3. Do you think that Egypt will overcome these challenges?

4. Based on your previous answer, please provide the reasons.

5. In your opinion, what are the solutions to these challenges?

6. What is the mechanism for applying these solutions?

7. In your opinion, what is the priority of the implementation of these solutions?

8. Based on your previous answer, please provide the reasons.

9. What are the main factors that could affect the application of AI?

   [Data availability - Education - IT infrastructure - Qualified Human Resources -Others]

10. Based on your previous answer, please provide the reasons.

11. Which are the sectors where AI can't be applied in the government?

12. What will be the expected advantages of applying AI to the government?

While the second round's questions including on the following

1. As an expert in the AI field, what steps should the government take according to its current progress toward AI to tackle the issues you stated before?

2. Do you believe that the initiatives you stated previously in the first round can be done now, according to Egypt's current resources?

3. Can you provide a reasonable interpretation of your previous answer?

4. What would you contribute to the national artificial intelligence strategy if you were assigned to work to reformulate and develop it?

5. Many successful countries have had success in the field of artificial intelligence. Which of these countries' experiences, in your opinion, may be used as a model for Egypt, and why?

6. Is there a difference between applying AI in the private sector and the governmental sector in Egypt?

7. Can you provide a reasonable interpretation of your previous answer?

8. What are the drawbacks or risks of AI?

9. How may these disadvantages or dangers be resolved?

Based on the responses to the first round of questionnaires, the questions for the second round were raised, and based on the replies to the second-round questionnaires, we would be able to complete the data collection analysis and find the proper recommendations for applying AI to the Egyptian government.

Chapter (5): Data analysis

The total number of participants in the research questionnaire is twenty. Their demographic characteristics are shown in the table below.

Table 1: *Demographic Characteristics of Respondents:*

Demographic	Category	Number	Percentage
	Male	12	60%
Gender	female	8	40%
	25- 30	3	15%
Age	31-35	3	15%
	36-40	6	30%
	41-45	6	30%
	More than 45	2	10%
	Bachelor of	8	40%

	computer science and information system		
Educational background	Bachelor of communication Engineering	2	10%
	DBA	2	10%
	MBA	1	5%
	Master of Economic Development	2	10%
	PhD	5	25%
Working sector	Public sector	11	55%
	Private sector	9	45%
Professional years	5 -10 years	3	15%
	11 -15 years	8	40%
	16 - 20 years	5	25%

	21 - 25 years	3	15%
	More than 25 years	1	5%

5.2. The analysis of participant's responses is as follows:

5.2.1. Challenges of applying AI

The challenges confronting Egypt's government sector are classified as such: administrative challenges and technical challenges. Among the major administrative challenges confronting Egypt's government in implementing artificial intelligence are a lack of awareness and knowledge of artificial intelligence.

This difficulty, in turn, is one of the factors that makes government workers resistant to the use of artificial intelligence, which has a negative impact on all institutions. Furthermore, there is an element of inefficiency in their use of modern technology at some administrative levels.

In addition to a lack of experience with artificial intelligence because it is a new technology in the government sector.

Because of the aforementioned reasons, such as a lack of awareness, knowledge, experience, and competence required for artificial intelligence technology, it can be said that a lack of qualified human resources in the government sector is one of the obstacles and challenges in the government sector.

As a result, no one can argue that the education system is playing a significant role in the field of AI, as it helps to develop awareness and knowledge of this modern technology and then create generations that are fully aware of how to apply it on a scientific basis.

This is followed by challenges, issues related to data availability and management, such as data security and data literacy. Data is an essential component of any AI application. It is difficult to obtain accurate, high-quality data for use in artificial intelligence in Egypt.

Moreover, the security concerns that the utilized data in the wrong ways might jeopardize the security of the country. In addition, the utilized data must be effective, which means that the correct data should be available at the right time for proper management and protection.

The figure (9) below shown the percentage of factors that could be challenges applying AI to the government according to the responses of participants, noticing that the participants selected more than one factor.
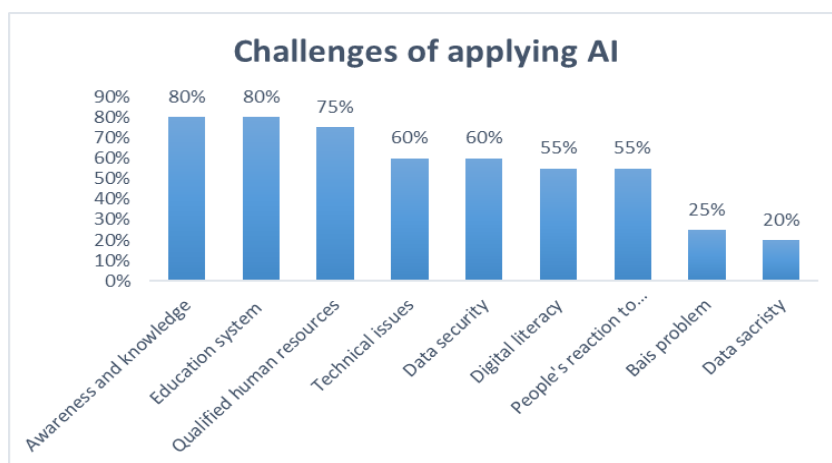

Figure 9: challenges may Egypt confront when applying AI in government

While the volume of data is one of the technical challenges confronting the Egyptian government in applying artificial intelligence, the volume of data generated globally is increasing at a rapid pace, from 33 zettabytes in 2018 to 175 zettabytes expected in 2025. Furthermore, data storage and processing will dramatically change within next five years. 80 % of data processing and analytics is now handled by data centers and central computing facilities, The remaining 20% is handled by intelligent computing objects such as vehicles, home appliances, or industrial robots, as well as nearby computing facilities.

This is followed by another technical challenges, such as process of natural language and algorithms, as well as the infrastructure of information technology, the absence of a cloud infrastructure in Egypt, particularly the existence of one of the major cloud services, known as "hyperscales," for instance, AWS, Google CP, or Microsoft Azure, poses significant barriers to Ai applications due to data location regulations that inhibit any data from fleeing the state.

And it would be preferable for Egypt to establish an integrated group to address natural languages for the benefit of the government as well as other entities, which would reduce the necessity for cloud storage that could harm the data center.

Add to all of the above challenges the challenge of Internet speed. Despite recent developments aimed at increasing Internet speed in Egypt, participants believe that it is still not sufficient.

The figure (10) below shown the percentage of factors of technical issues that represent challenges in applying AI to the government according to the responses of participants, noticing that the participants selected more than one factor.
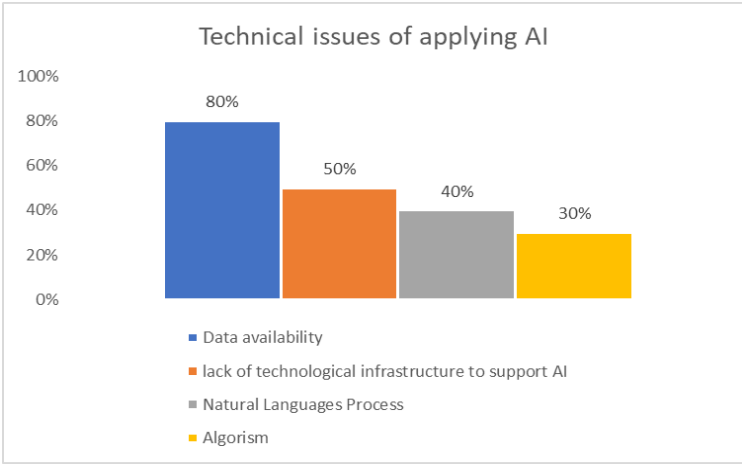

Figure 10: difficult part of applying AI for Egypt

Most participants believe Egypt will overcome these challenges due to the Egyptian government's working quickly on the process of digital transformation and infrastructure provision, and because it has a national council for artificial intelligence that will implement its national artificial strategy. It should also overcome these challenges due to international standards and globally competitive rates and indexes. They also believe that Egypt now has artificial intelligence faculties, which will help to create a new generation of highly qualified individuals in the future.

5.2.2. Benefits of AI

The superiority of AI's problem-solving and analytical abilities is cited by all participants as a positive effect of AI. In addition to how quickly services are implemented and their accuracy, efficiency, and effectiveness, AI has the ability to enhance analysis and reduce costs associated with making the proper decisions.

With respect specifically to the Egyptian government, the implementation of artificial intelligence in the Egyptian government will make all advanced Egyptian systems, moreover, artificial intelligence will reduce dependency on expertise and functional rotations within the organization's functional structure.

In addition, AI will easily link government institutions to each other, saving time, reducing errors, and delivering better quality services at affordable prices.

On the other hand, AI will work on a robust predictive analysis in these fields (population, food security, national security, and health) in the future. Besides that, artificial intelligence fuels many inventions in almost every field, helping humans solve the most complex problems.

Furthermore, if AI is applied to the general authority for investment, it will encourage direct foreign investment by facilitating access to all necessary data and procedures for companies and improving efficiency in further development, resulting in the introduction of better products and services.

Another significant advantage of AI is that it overcomes many of humanity's dangerous limitations through the development of an artificial intelligence-based robot capable of risky tasks such as bomb disposal. It can also be used to discover

the deepest parts of the oceans, as well as mine coal and oil. It works in any kind of natural or man-made disaster.

Add to that, the average human being works four to six hours a day, excluding pauses. Humans are characterized by the fact that they might take a break to recharge their batteries and prepare for a new day of work; some even get a weekly vacation. They need to strike a healthy balance between their professional and personal lives. And, unlike humans, we can run machines 24 hours a day, seven days a week using AI, and they won't get bored.

In general, artificial intelligence will improve services to citizens, reduce budgets, create new jobs, reduce corruption, save time and effort, and reach the effectiveness of the Egyptian government.

5.2.3. Drawbacks of AI

As we all know, everything has benefits and drawbacks. The drawbacks of AI are represented in, risks in all fields, including human resources. Machines are undeniably superior when it comes to productivity, but they can't replace the human connection that binds the team together. Machines are unable to form human connections, which is a crucial attribute in team management.

Increasing unemployment: As repetitive and other routine labor is replaced by AI robots, human interference decreases, posing significant difficulties in employment conditions. Each organization strives to replace the least unqualified employees with AI robots that could also perform an equal task more efficiently. Perhaps AI

will not take over the world, but it will take over jobs, necessitating plans to re-employ the workforce that has retired.

Human laziness: AI makes humans slothful with its applications. Humans have a tendency to become attached to advancements that automate the majority of their work, which could be a problem for future generations.

Absence of creative thinking: Machines can only do the functions for which they were planned or specifically designed; anything further leads them to fail or generate meaningless results, both of which would be ruinous.

On the other hand, there's a chance you'll lose critical data. It is possible that vital information is lost as a result of technical issues on the system, such as machine damage or corrupt software.

We store almost all of our important documents, files, pictures, and videos on computers, smartphones, and other devices. It is very difficult to recover this information once it has been lost.

The lack of AI ethics, when we use AI for critical issues such as drugs, and sexual and military purposes, the ethics of AI is neither specified nor limited.

Artificial intelligence exploitation: Misuse or exploitation of anything is bad, It's even worse in the case of artificial intelligence. There are threats that the misuse of technology will bring the world to its knees. If AI falls into the wrong hands, high-tech machines have the potential to destroy society.

And we can't deny that the cost is a major risk for AI because creating a machine that can simulate human intelligence is no easy task. It takes a significant amount of time and resources, and it can be quite costly. Because artificial intelligence needs constantly updated hardware and software, it must be updated over time to reflect the most recent requirements. The machines necessitate costly repairs and maintenance. Its creation necessitates exorbitant costs due to the complexity of the machines.

We can summarize the AI drawbacks as Cybersecurity threats, employment crisis, system failure and downtime, technical support, models that ignore human evolutionary behavior, and digital attacks.

5.2.4. Suggested Solutions

All participants agreed that the Egyptian government should start implementing capacity-building programs to familiarize government workers with artificial intelligence and raise awareness and understanding of its applications, as well as support individuals and groups with expertise in artificial intelligence and its applications, as well as researchers involved in the research and development of AI technology.

Furthermore, the Egyptian government must develop retirement plans for current executives whose ages are approaching the retirement age, as well as take advantage of young people's abilities and provide them with opportunities to drive.

In terms of international cooperation, countries' successful experiences with artificial intelligence applications should be leveraged through the implementation,

holding, and attendance at appropriate international meetings and workshops to keep abreast of developments in the field of artificial intelligence. We cannot ignore Egyptians' experience working abroad in this field as well as, we must capitalize on their practical and scientific knowledge and provide them with appropriate incentives.

Some participants also suggested that a strategic digital transformation plan should be developed and linked to the national AI strategy. The plan should include a clear budget for its implementation as well as political support for its implementation, it is also preferable to establish a unit under the umbrella of the Council of Ministers to collect the necessary data for the application of artificial intelligence from government bodies and ministries.

This unit will encourage bodies and ministries to share and submit data with great accuracy.

Participants proposed solutions to mitigate the drawbacks of AI, such as the adoption of a United Nations Charter to which all states must adhere, rapid rehabilitative care, and how institutions should assist people nearing the end of their working lives in learning new jobs quickly. Otherwise, unemployment will rise, and there will be strong opposition to change.

Also, it's better to use a scientific approach to problem solving with an experience system in each field applying AI. On the other hand, it would be better if we start applying AI with a small project or determine a service as an experiment, then progress to development once the project has been completed. It's not forgettable

that all these solutions need to be provided at a high cost as well as necessitate a large number of skills.

Participants discussed some steps that the Egyptian government could take in light of its current progress in the application of artificial intelligence. As previously stated, it is best to study successful experiences in developed countries in the field of artificial intelligence in order to capitalize on them. Internally, the Egyptian government should hold scientific competitions to encourage information technology researchers to provide the best scientific research and benefit from it, particularly in the field of AI. It is also preferable to hold these competitions with international participation in order to maximize the benefit to countries.

In addition to the aforementioned, launching a digital transformation strategy and linking it to the use of AI-enabled applications; developing a major plan for execution backed by political will; legislative reform to allow and regulate cloud computing; developing open data portals accessible to working civil servants; developing a major plan for the reuse of existing human resources that will not fit into the new ecosystem as well as several leadership positions

The Egyptian government must now plan and prepare for the construction of Egyptian development centers for the application of artificial intelligence and to deal with its problems and create solutions to confront the problems expected from its application, as well as prepare the team of experienced and scientifically competent managers of this center. This is in addition to building a national cloud center while ensuring cybersecurity and the provision of appropriate infrastructure.

As far as the education system is concerned, the Ministry of Education would prefer to introduce an AI course from the preparatory stage to equip future generations to deal with AI once applied and to encourage them to enroll in AI colleges immediately upon completion of pre-university education.

Not only should these steps be taken, but the government should also seek expert advice in order to provide qualified trainers and a variety of training programs, to raise awareness, build capacity, and link recruitment and career progression to work with artificial intelligence technology, as well as establish a data science team in all government institutions.

5.2.5. Egypt's resources vis AI solutions

All participants have no doubt that the previous steps stated previously could apply given Egypt's current resources because Egypt has a lot of resources, but the problem is deciding what to do with them and how to make the best use of them. Furthermore, the digital transformation of the Egyptian government is in its initial phases, and there is no strategy in place, so anything can be done when creating a local government demand for AI applications, particularly in the areas of health, support, and government procurement.

To put these solutions into action, Egypt must direct its resources toward technology, such as establishing a cloud center with cyber security, beginning to incorporate AI into all educational processes, including schools, and launching governmental initiatives with high pay for those qualified for AI, mass training for employees, public awareness, and the use of skilled Egyptians in developing the

algorithm, not depending on imported software, upgrading its internet infrastructure, and providing several training programs.

All of the solutions mentioned above are dependent on the government's really well allocating a specific amount of money to that issue. In addition to professionally implementing their strategic plans with political support and an acceptable budget as the foundation for action plans and identifying those responsible for implementation and success indicators for these national projects, but this does not diminish the value of Egypt's thinking going forward to see where the world will be.

5.2.6. Strategy and Sectors

Most participants stated that all sectors are suitable for implementing AI. However, only a few participants stated that some sectors are not suitable for implementing AI, such as those concerned with civil documentation, ethical decisions, and sectors that require human spirit. Not only this but also any sector that doesn't have unqualified people is not suitable for applying AI.

Regarding the national strategy for artificial intelligence, the participants stated that if they were offered the opportunity to contribute to the strategy's revision, they would like to make the following observations, The strategy should specify how to employ technologies like AI, machine learning, the internet of things, data and text mining to improve research, data and text mining, neural networks, fuzzy systems, and so on. In addition to the how-to monitor the implementation, it should include performance indicators, a timeline, and develop clear evaluation benchmarks and metrics.

Furthermore, it is preferable if the strategy includes a clear system and the HR development training that the government requires. It should state appropriate operational tools for promoting major ethical principles and fighting bias, in addition to having concrete codes of conduct.

It would be preferable if they included a section about relying on technical standards to help with common problems when applying AI.

5.2.7. Differences Between the Private Sector and Public Sector in Applying AI

As shown in figure (11) below, 60 % of respondents, there is a distinction between the use of artificial intelligence in the public and private sectors. This is due to the fact that the private sector, particularly in the field of e-commerce, has already implemented Aside from AI, the private sector is much more adaptable in terms of decision making, workforce planning, and process redesign. All are required to include major transformations such as AI. On the one hand, the government requires a rigid system that is strictly enforced, but the private sector requires delightful customer service to attract investments.

Differences may also be represented in the type of analysis, data, usage, and so on, and each environment is distinct. Besides that, the private sector is more helpful because it invests more money in each project and is more interested in it.

Meanwhile, 40% of respondents believe there is no difference between the two sectors because the government sector has not advanced significantly, and its main issues are application and generalization. In the private sector, quick profit is more important than technological progress, and there are no companies that pay for modern inventions in the same way that they do in developed countries. The two sectors serve the same purpose, and the ecosystem is the same.
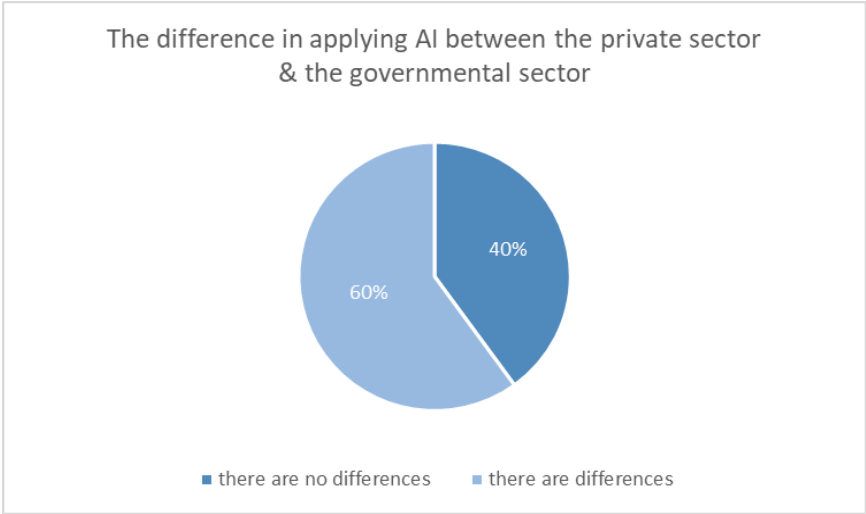

Figure 11: A percentage of whether there is a difference in the application of AI in the private sector from the government sector

The participants believe that many countries, as shown in figure (12) below, that have had success in the field of artificial intelligence may be used as a model for Egypt, such as:
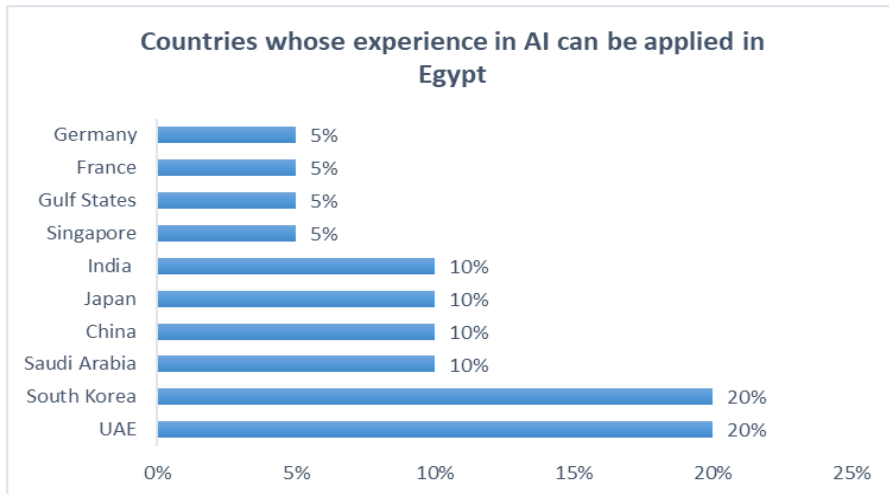
Figure 12: Countries that have successful experience in AI and whose can be useful for Egypt

As participants (A, B, C, and D) said "The UAE, because it employs the same strategy and conditions as the 2030 strategy and conditions, with the exception of the economic conditions that can be overcome."

Participants (E and F) "The Gulf States, there is a large population of the Egyptian workforce there, some of whom even participated in the AI transformation and have the necessary experience. That way, the new environment will feel more familiar to large segments of Egyptian society."

Meanwhile, participants (G, H, I, J, K, L, M, and N) suggest "South Korea, China, India, and Germany, because of the different diversity of experiences studied to be able to create an Egyptian pure model and Egyptianize the thinking."

Participant (O) "France, because they used artificial intelligence in their transportation and logistics sectors, which are critical to Egypt's development."

Participants (P and Q) "Saudi Arabia, because it is the most culturally similar country to Egypt."

Participants (R and S) "Japan, because it applies to the AI project, so we can use Japanese projects as a model in Egypt because they have an AI project in every single field of life."

Lastly participant (T) "Singapore, because the two countries share the same environment."

5.3. Findings:

After analyzing the responses of the participants, we can add a new independent variable that has an effect on the application of artificial intelligence. This variable is awareness and knowledge.

The reasons of these variable according to participants are:

Awareness & knowledge: employees in public sector must have a level of knowledge about artificial intelligence in order to raise their awareness before using AI, which will reduce their resistance to change as well as their fear of AI replacing their jobs. And this is supported by what is mentioned in OECD (Radwan & Sobeih, 2021). So, this variable considered as an independent variable.

Education System: Developing the education system by introducing scientific material on artificial intelligence in the early stages of education and connecting vocational training to university education will help to create generations with higher skills and qualifications for work, as well as help to develop artificial intelligence. And this is supported by what is mentioned in report Artificial Intelligence in Education (Chakroun, Holmes, Mendes, West, & Casado, 2019). So, this variable considered as an independent variable.

Technological Infrastructures: Egypt must build its own cloud, as well as continue to work on improving internet speed, software and hardware programs that AI will require, and all technological infrastructure that supports AI. And this is supported by what is mentioned in the article of Implementing challenges of artificial intelligence (Sharma, Sunil , Joshi, & Kumar, 2021). As a result, this variable is considered as an independent variable.

Qualified Human Resources: Human resources are the most valuable asset of any organization, but if they are not properly qualified, they can be a major burden. Workers must have the necessary skills to apply and use AI, so they must go through training to prepare qualified staff before implementing AI; otherwise, it will be a major challenge and a waste of time and money. And this is supported by what is mentioned in the article the challenges and opportunities of artificial intelligence (Kaplan & Haenlein, 2020). This variable is considered as an independent variable.

Data Availability: AI is based on data, data availability is difficult in Egypt due to the sensitive and confidential nature of the data that can be used in AI, as well as the multiplicity of government agencies that make it difficult to coordinate and collect the necessary data. And this is supported by what is mentioned in the article implementing challenges of artificial intelligence (Sharma, Sunil , Joshi, & Kumar, 2021). This variable is considered as an independent variable.

On the other hand, we can use the integration of the institutional theory with the regulatory theory, because the adoption of the principle of good administration is critical to ensuring efficiency not only in data use but also in how to collect the

proper data from the various institutions, as well as the possibilities associated with good administration in terms of efficacy and social precaution. When public administrations make automated decisions, they must explain how the algorithm worked and what type of data was used to achieve that result.

And the regulatory theory, because current Egyptian legislation does not yet exist to prevent or mitigate the challenges and risks associated with the use of AI by the public sector. As a result, mechanisms such as developing the civil servant law must be developed to address the issues associated with applying AI in the public sector.

Chapter (6): Conclusion and Recommendation

6.1. Conclusion:

After reviewing numerous previous studies and based on the responses of the questionnaire participants, it is clear to us that all of the preceding significance of artificial intelligence applications does not preclude the existence of the following:

First, challenges face not only the Egyptian government in particular in its application but all countries using artificial intelligence, but the degrees of challenges vary depending on each country's preparations for dealing with and overcoming those challenges.

Second, the risks of using artificial intelligence and how to prepare to address the side effects of using artificial intelligence must be considered when formulating the strategy for using artificial intelligence and identifying clear scenarios for this, whether from determining how to implement it, its cost, or the time required for it.

Although AI is important, if it lacks a clear vision to overcome its poor use, it represents a particularly significant risk in terms of data.

As we can see from the literature reviews and the responses of the survey participants, artificial intelligence greatly aids in making the best decisions because it analyzes data in a timely manner and provides a sound vision based on the data provided; additionally, it can automate many time-consuming tasks. In addition to routine tasks such as automating the creation and routing of correspondence, AI will aid in the preparation for, and management of, crises.

According to the study's findings, Egypt has already begun to address some of these issues. In terms of the Egyptian government, we can see that Egypt is making every effort to develop a roadmap for the application of artificial intelligence, such as: (Ministry of Communications and Information Technology, 2022).

The Egyptian Cabinet approved the establishment of the National Council for Artificial Intelligence (NCAI) in November 2019, which will include representatives from all relevant government entities as well as independent AI experts (AI). The Council's primary goal is to formalize and govern the implementation of Egypt's National AI Strategy.

A special AI platform will be launched under the auspices of the National Council for AI as Egypt's official AI portal. It includes the National AI Strategy, events, news, and details about AI projects in Egypt, capacity-building programs offered by various institutions, and Egypt's achievements in this field. The platform allows stakeholders from the government, public and private sectors, academia, and startups to exchange ideas and experiences on AI issues.

The Egyptian reform program aims to launch a series of large-scale development projects in a variety of sectors, with AI as a key supporting tool.

Signing a partnership agreement with the French Ministry of Economy and Finance to develop an AI collaborative effort.

Signing a twinning agreement with the National University of Singapore's AI Singapore (AISG). The goal is to collaborate to raise AI awareness among all

segments of society and share information by establishing a governmental center of excellence (CoE) for AI to implement projects using the most recent global techniques. The two parties also affirmed to provide hands-on training in pragmatic AI for graduates and government employees.

In collaboration with Teradata, 100 public servants, specialists in various fields such as agriculture, health, industry, planning, irrigation, and others, received training on the basics of AI. The purpose is to help trainees identify relevant problems that AI can help with.

Egypt actively participated in the drafting of the AI recommendations document in collaboration with the Organization for Economic Cooperation and Development (OECD), which includes the principles for the responsible use of AI, such as capacity-building, governance, responsibility, humanity, transparency, and other important principles.

As well, Egypt is the first Arab and African country to officially join the list of countries that have endorsed the OECD document on responsible artificial intelligence.

However, some challenges remain unresolved, such as how to collect and secure data from entities, as well as the need to develop a financial plan to implement these solutions or allocate a percentage of Egypt's GDP to meet the needs of artificial intelligence.

It is also necessary to monitor and evaluate some of the solutions that Egypt has begun to implement in order to develop or eliminate them if they fail to produce the desired results

This research tried to examine through the available information on artificial intelligence in Egypt as well as the relevant literature reviews and referred to some experts in both the private and public sectors who were involved in the work on the AI file in order to provide some appropriate solutions and capitalize on previously presented strengths in order to reduce the risks of applying artificial intelligence in Egypt, as well as capitalize on Egypt's opportunities in order to overcome the weaknesses mentioned in the SWOT analysis in Chapter 2.

6.2. Recommendations:

In this paper, two contributions are made: First, a research framework can be proposed in this paper (chapter 3) for analyzing the factors that may affect the implementation of AI in the Egyptian government, which may help future research to prove or not. Second, the paper suggests policies recommendations that could assist Egypt in meeting the challenges posed by artificial intelligence.

These policies recommendations represented in as follows,

For Raising the Knowledge and Awareness about AI

It's better to start lunching an advertising campaign to increase citizens' awareness and knowledge of the application and use of artificial intelligence.

Second, enhancing international collaboration in the field of artificial intelligence between the Centre of Artificial Excellence and similar centers in developed countries to exchange knowledge.

Third, strengthening international ties with countries that have made advances in artificial intelligence, particularly those with strong economic and international ties with Egypt, such as South Korea, the United Arab Emirates, and Germany to Study their experiences to benefit from them and apply what suits them in Egypt.

For Data Issues

First, putting the Egyptian data center under the supervision of Egyptian security agencies, such as general intelligence and national security, in order to avoid the risk of data exploitation endangering the country's security and peace.

second, enact the laws required to protect against the dangers of artificial intelligence, particularly that Egypt participates in international conferences on artificial intelligence ethics and that help Egypt to provide it with the full knowledge required to begin.

For Improving the Education System

In terms of education, start with the primary stage and allocate scientific materials for the introduction of artificial intelligence to prepare a new generation that has been educated well for the labor market that requires new skills needed for AI.

For Enhancing the IT Infrastructure

To enhance the IT infrastructure, it is required to continue to develop scientific research, so it is preferred to initiation of competitions with enticing incentives to benefit from scientific research in the fields related to developing IT infrastructure & artificial intelligence.

Allocating a budget from the state's GDP to research and develop artificial intelligence, as well as signing loan agreements with developed countries or financial institutions to fund AI projects.

Increasing funding for enhancing artificial intelligence infrastructure, such as the establishment and development of an Egyptian cloud.

For Qualifying Human Resources

Collaboration between the public and private sectors in the field of artificial intelligence to leverage private-sector expertise in the public sector.

Doing field trips to countries with a strong AI presence to learn from their experience and applicability.

Evaluating the staff trained in training courses in industries where AI applications are used to determine the extent to which the training courses affect their progress, and develop those courses first to meet the needs of the industry in applying AI.

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Appendix (1)

List of Figures

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Appendix (3)

List of questionnaire participants

A: The participant has 20 years of experience in the public sector, a bachelor's degree in computer and information science, and a diploma in human resources.

B: The participant has 22 years of experience in the public sector, a PhD degree in information system.

C: The participant has 14 years of experience in the public sector, a bachelor's degree in computer and information science.

D: The participant has 6 years of experience in the private sector, a bachelor's degree in computer and information science.

E: The participant has 17 years of experience in the private sector, a PhD degree in Economics.

F: The participant has 25 years of experience in the private sector, DBA degree.

G: The participant has 30 years of experience in the private sector, a PhD degree in Economic, and a diploma in Artificial intelligence.

H: The participant has 15 years of experience in the public sector, DBA degree.

I: The participant has 18 years of experience in the public sector, a bachelor's degree in communication engineering.

J: The participant has 9 years of experience in the public sector, a PhD degree in computer science.

K: The participant has 10 years of experience in the private sector, a bachelor's degree in computer and information science.

L: The participant has 20 years of experience in the public sector, a master degree in economics.

M: The participant has 11 years of experience in the private sector, a bachelor's degree in computer science.

N: The participant has 13 years of experience in the private sector, a bachelor's degree in computer science.

O: The participant has 12 years of experience in the public sector, a master degree in international Economics.

P: The participant has 10 years of experience in the public sector, a PhD in communication Engineering.

Q: The participant has 12 years of experience in the private sector, a bachelor's degree in communication Engineering.

R: The participant has 5 years of experience in the private sector, a bachelor's degree in computer science.

S: The participant has 12 years of experience in the public sector, a bachelor's degree in computer science.

T: The participant has 21 years of experience in the public sector, MBA degree.

국문초록
이집트 정부에서의 인공지능 구현
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글로벌행정전공

인공지능(AI)은 일반적으로 인간이 할 수 없는 일을 기계가 수행하는 방법을 개발하는 컴퓨터 과학의 한 분야이다. 특히 Henlein & Kaplan에 따르면, 이 연구에서 다음과 같은 정의를 사용했는데, AI는 "데이터를 올바르게 처리하고, 그러한 데이터로부터 학습하며, 이러한 학습을 사용하여 유연한 적응을 통해 특정 목표와 작업을 달성하는 시스템의 능력"이다.

이집트에서 인공지능을 적용하는 것은 매우 중요한 문제인데, 특히 머신러닝과 같은 데이터 중심 인공지능이 경제 및 사회 시스템에 상당한 영향을 미칠 것으로 예상되기 때문이다. 이집트의 인공지능 국가전략에서 밝힌 대로 2030년까지 경제규모를 15조 달러 늘리는 것은 물론 AI를 자국 경제에 완전히 접목한 국가들의 GDP 성장률이 25%에 육박할 것이라는 전망이 나온다.

본 연구는 정부에 AI를 적용하는 메커니즘과 관련하여 이집트가 직면할 과제와 이집트의 자원을 기반으로 한 해결책의 우선 순위를 심층적으로 조사하였다. 또한 인공지능에 대해 연구하고/또는 가르치고 있는 공공 부문 및 민간 부문 인력을 대상의 설문지를 기반으로 데이터수집을 하였으며 델파이 방식을 사용하였다.

문헌 검토와 데이터 수집 이후 이집트 정부에 난제가 될 수 있는 요인은 데이터 가용성, AI에 대한 기술 인프라 지원, 사람에 대한 AI에 대한 인식과 지식, 교육 시스템, 자격 있는 인력 등이다.

이집트는 이러한 문제들 중 일부를 극복하기 위해 노력하고 있지만, 여전히 해결이 필요한 문제로 남아있다. 본 연구에서는 이러한 과제를 해결하는 데 도움이 될 수 있는 몇 가지 사항을 제언한다.

주요 키워드: 인공지능, 인공지능 도전, 정부, 공공 부문, 이집트