



## *Evaluation of the Possibility of Applying Artificial Intelligence Technology in Egyptian Smart City Planning*

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### **Abstract**

The world and Egypt are currently paying great attention to the file of artificial intelligence and its applications in various sectors to achieve the country's goals in building digital Egypt and implementing the national strategy for artificial intelligence. A smart city is an urban area that relies on information and communication technology to improve the efficiency of its operational processes, in addition to raising the quality of services as it works to meet the needs of the current generations and ensure the needs of future generations, to improve living conditions in the city. In this sense, the research is concerned with studying the possibility of applying artificial intelligence in Egyptian smart cities and formulating recommendations through which it can be activated in planning smart cities and then achieving sustainable development in Egypt.

**Keywords:** Smart city, sustainable development, Artificial Intelligence, Technology.

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# 1. Introduction

The importance of the Artificial Intelligence lies in the multiplicity of areas that enhance its technical capabilities. For example, it is used in the medical, business, education, and the environmental fields, as well as in the field of urbanization. Artificial intelligence applications are used in spatial analysis, identifying risks, strengths and weaknesses in an area. For example, the use of GIS in determination of the appropriate land uses for an area based on a set of analyzes, as it can understand and analyze the inputs to provide outputs that meet the user's needs with high efficiency, and gives a future vision of the shape of that area.

Egypt pays great attention to the file of artificial intelligence and the use of its applications in various sectors in order to achieve the state's goals in building digital Egypt and implementing the national strategy for artificial intelligence. In 2020, Egypt witnessed the implementation of a number of initiatives in the field of artificial intelligence, the most prominent of which were:

- Egypt has made progress in ranking Egypt in the "Government Readiness for Artificial Intelligence" index issued by the "Oxford Insight" Foundation and the International Development Research Center by 55 ranks, making Egypt 56th in the world among 172 countries.

- The Ministry of Communications and Information Technology has cooperated with various international companies to use artificial intelligence applications and innovative solutions in order to enhance and develop government operations.

- Selection of Egypt for the position of Vice-Chair of the UNESCO expert group in charge of preparing the recommendation related to the ethics of artificial intelligence.

- Egypt launched a special platform for artificial intelligence to become the country's official portal in the field of artificial intelligence. It includes the national strategic platform for artificial intelligence, and all events, news and details of artificial intelligence projects.

The Egyptian government plans to establish 38 smart cities - 4th generation cities -, which are distinguished by their nature in meeting the needs of citizens in all aspects of life through technologies that save time and effort and seek to provide a digital environment that stimulates learning, creativity and is environmentally friendly that contributes to providing A sustainable environment that enhances the feeling of happiness and health, as Egypt is preparing to enter the era of smart cities by establishing 14 cities with international technological standards, including (The New Administrative Capital - New Alamein - New Mansoura - East Port Said - Nasser in West Assiut - West Qena - New Ismailia - New Rafah - Galala City and Resort).The new smart cities rely on a network of smart facilities, to manage and operate all vital facilities Including electricity, water and gas.

In this context, the research aims to assess the readiness of the Egyptian case to use artificial intelligence applications in planning smart cities, and to identify the incentives, obstacles, and repercussions of using these applications in Egypt, whether economic,

environmental, administrative, technical, etc., and this is done by reviewing the various applications of artificial intelligence in smart cities, by studying some global and regional experiences of smart city planning and then coming up with recommendations to activate the use of artificial intelligence applications in planning smart cities in Egypt.

## **2. Research Objectives**

The research aims to identify the concept of smart cities and their importance in achieving sustainable development and its components, identify the current trends towards artificial intelligence and determine the relationship between them and the global applications of artificial intelligence in smart cities and through which it is possible to identify the strengths that can be built upon and the weaknesses that need to be addressed to activate artificial intelligence in Egyptian smart cities.

## **3. Research Methodology**

The research methodology is based first on identifying the concept of smart cities and their components and artificial intelligence. Then defining the relationship between them, reviewing some global experiences of applying artificial intelligence for smart cities, and coming up with the most important strengths and strategies for its application, and then identifying Egypt's strategy to analyze strengths and weaknesses, and thus reach recommendations that enable Activating artificial intelligence in Egyptian smart cities.

## **4. The concept of smart cities and their components**

### **4.1. The concept of smart cities**

With the beginning of the twenty-first century, the unprecedented expansion of information technology led to the rapid transfer of the world from the industrial age to the information age. For societies such as electronic commerce, e-mail, e-education and e-government, all of this led to the emergence of the information society, and given that the city is the place where individuals practice various life activities that have become increasingly dependent on technologies, changes have begun to occur in the structure of the city in response to the requirements of those activities. [1]

The concept of smart cities originated more than a decade ago. Smart cities emerged in the late 1990s, driven by the vision of decision makers having the ability to simulate the urban environment in real time [2]. In the mid-2010s, as this concept flourished and was thoroughly discussed, both in industries and in literature, this concept was derived from five different aspects, namely, sustainable cities, smart cities, urban information and communication technology, sustainable urban development, sustainability and environmental issues, urbanization and urban growth [3].

A smart city is an urban area that relies on information and communication technology in order to improve the efficiency of its operational processes, in addition to raising the quality of services to increase the level of the city's well-being. As it works to meet

the needs of generations in the current situation and ensure the needs of future generations, to improve living conditions in the city. Where the vision of the city planners is to make life for everyone better than it is at the present time according to the exchange of a huge amount of data about energy, waste, recycling, etc. It is the city that uses technology to transform its basic systems and manages its resources effectively. The smart use of resources drives innovation, supports competitiveness and economic growth, and investing in a smart city is a kind of sustainable employment. All platforms can be made smarter by being digital, allowing for quick, informed decision-making. [4]

In addition to changing the speed of how city data is analyzed and processed, a smart city enhances the lives of citizens, especially by using data that improves housing or transportation. [5]

The smartest city is the one that uses technology to transform its basic systems and improve the returns from its limited resources, through the use of resources in a more intelligent manner, and to promote innovation, which is a major factor in supporting competitiveness and economic growth, and smart cities provide the opportunity to achieve sustainable well-being

It aims to harness the capabilities of ICTs in urban management systems to create cities that are not only economically and socially advanced, but also designed to achieve full environmental sustainability. [1], [4]

## **4.2. Components of Smart Cities**

The smart city includes three aspects represented in a technical aspect, an environmental aspect, and a social aspect. From a technical point of view, it is a digital and virtual city, as it is provided with information and communication technology technologies, wireless networks, and sensor networks, so that they constitute basic elements of the urban environment. A system for the operation of the smart community and for smart urban management. Environmentally: it is an environmentally healthy city, in which there are networks for the distribution of clean, low-carbon energy, and environmental technologies that help sustain the urban structure. With a high percentage of education and creativity, it also depends mainly on the creativity of individuals, the communication infrastructure and knowledge management.

The dimensions of the smart city are related to the traditional theories of development and urban growth, such as transportation, economy, natural resources, quality of life, and participatory. Six distinct dimensions of the smart city can be identified as shown in fig1.

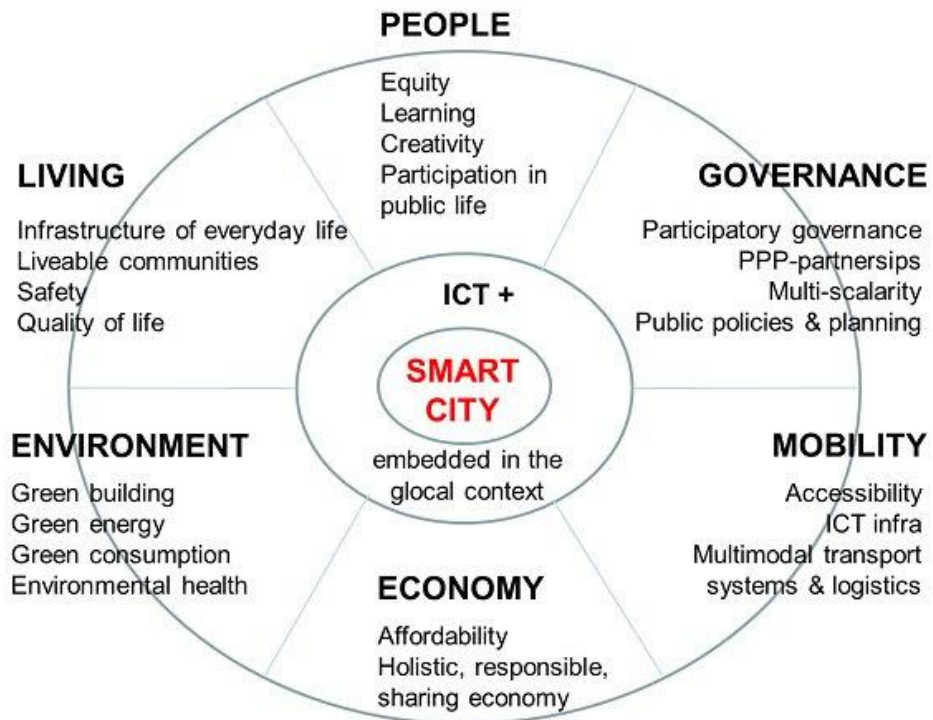


Fig. 1 Components of smart cities

Source: [6]

- **Smart Economy:** It is a concept of how to achieve the best for current and future generations at the same time, through policies that encourage innovation and creativity along with scientific research, high technology and concern for the environment (Hafez, 2022). In addition, in turn is linked to a group of factors such as labor market flexibility and international relations in addition to Activating the role of scientific research and technology in raising the economic level. [7]
- **Smart Living:** which includes a group of events and activities that contribute to providing a good quality of life, including cultural, educational, and tourism events, emphasizing the quality of the health system, and providing good quality buildings.
- **Smart Environment:** The availability of a smart environment is linked to a set of factors such as managing natural resources, protecting the environment, and reducing the level of pollution. The smart environment is measured by the attractiveness of the natural environment, pollution levels, environmental protection activities, and resource management methods. For example, the use of smart energy such as solar energy or wind energy is one form of green energy sources [8].

- **Smart People:** as it requires the establishment of a smart city that provides an adequate level of culture for individuals and works to increase their level of creativity [7]. Having an intelligent people dimension in the framework is important because it aims to improve the way of life, increase human capital, increase the human development index, and ensures that people have a high degree of resilience and resilience under changing circumstances [3].
- **Smart Mobility:** Providing a smart transportation system depends on linking the transportation system with technologies to create safe, sustainable, innovative and accessible transportation systems locally and internationally [9].
- **Smart Governance:** Developing the government work system through technologies and providing government services through electronic channels. It is based on three main building blocks: stakeholder participation, provision of services based on information and communication technology, and network-based relationships such as cooperation or partnerships [7] , [10].

#### **4.3. The importance of Smart Cities in Achieving Sustainable Development**

With the increasing population growth around the world and the pressures on the environment, which is still considered one of the dimensions of sustainable development, it has become clear the importance of the need to manage the environmental, social and economic sustainability of resources, and then it is necessary to move towards activating smart cities that rely on technology and clean energy that preserve the environment and allow citizens and government authorities Local work together to launch initiatives and use smart technologies to manage assets and resources in the growing urban environment.

It is clear that smart cities help improve the quality of life of citizens through databases, advanced transportation systems, and smart buildings that connect people and enable sharing of information to meet their needs in light of preserving the environment [9].

### **5. Artificial Intelligence**

Artificial intelligence is a technology with an increasing number of applications in the urban context, and it is considered the most powerful of the current technologies with both positive and negative externalities for cities [11]. It practices learning and gaining knowledge, both directly by sensing the environment for example, cameras and microphones, and indirectly by means of large datasets installed by developers. It is the ability to understand the acquired and skill related to data by extracting concepts from it [12]. Its concept thus centers around the system's ability to correctly interpret external data, learn from this data and use this learning to achieve specific goals and tasks through flexible adaptation [13].

### **6. The relationship between Smart City and Artificial intelligence to Achieve Sustainable Development**

The term "Smart or intelligent" is the common denominator between smart city and artificial intelligence. Artificial intelligence is a field that seeks to build mechanisms and develop devices that stimulate thinking while allowing for independent, fact-based decision-making. The efficiency and effectiveness of the answers provided by AI improves exponentially in proportion to the amount of data collected and processed. The collected data is also enhanced through deep learning, a technology that improves decision-making through classification, clustering, and regression [14].

Artificial intelligence has the potential, if used properly, to provide a vehicle for positive change that can foster sustainable transitions to a more resource-efficient model of living. AI, with its deep learning functionality and capabilities, can be used as a tool that enables machines to solve problems that can fix urban landscapes [13].

The use of big data and artificial intelligence allows a broadening of possible analytics to find a way to measure and, as a consequence, make an evidence-based decision, such phenomena as spatial quality and urban image. It helps to effectively combine quantitative studies with qualitative approaches, and even identify behaviours, feelings or happiness. Big urban data and AI-based tools can help shape urban policies to support urban change [15].

Integration of information and communication into the basic operations of smart sustainable cities is important to achieve true sustainability, and these technologies can help create these cities through innovation, as well as through redesigning existing processes, and this can include applications, technologies, and new energy systems, and information and communication technologies can To provide an integrated strategic approach to sustainability and intelligence in smart cities, and to make them key enablers in urban development. It is also smarter from a technological perspective, resulting in more flexible and simpler use [1].

From this point of view, artificial intelligence can help activate smart cities and thus achieve sustainable development.

## **7. Smart Cities Around The World which adopting AI Technologies Case Studies**

### **7.1. Masdar City**

Masdar City is a major new settlement under construction in Abu Dhabi (UAE). The project was launched in 2007 and is expected to be completed in 2030. The city of cities is direct to the elements of sustainability, the city is designed on an area of 7 km<sup>2</sup> and its population is 90 thousand people. [16]

For more than 10 years, it has witnessed the development of a large number of smart technologies, starting from smart networks to self-driving vehicles, as it has an integrated smart transportation network, which includes rapid personal mobility without a driver from point to point by electric car, ride-sharing system and programs, as well as public transportation.

Artificial intelligence has become a prominent feature of the Emirati city which, given its experimental nature and long experience in smart urbanization, is a useful case study to observe and empirically track the gradual emergence of urban artificial intelligence.

#### 7.1.1. Application of Modern Technology and Artificial Intelligence in the city

Smart technology applications in the city are studied within the framework of smart city components

##### 7.1.1.1. Smart Government

- Using geographic information systems technology, a base map of the city was created, all its location data were saved, and a data bank was built on the city's location, which helps in conducting various studies.
- The use of geographic information systems technology to follow up the stages of implementation to review and evaluate each stage and avoid the recurrence of obstacles that occurred in the subsequent stages of implementation.

##### 7.1.1.2. Smart Economy

The city's economy is based on technological innovation and sustainability

##### 7.1.1.3. Smart Environment

- The optimal location of the city was chosen using remote sensing techniques and geographic information systems in terms of determining the road network that connects the site to the outer region of the city, as it is located 17 km from the center of Abu Dhabi city and is also located near Abu Dhabi Airport.
- Conducting an analysis of the city's location data in relation to the wind and the sun, using geographic information systems technology, to choose the optimal orientation for it.
- Streets are designed in such a way as to benefit from natural ventilation to reduce energy use.

##### 7.1.1.4. Smart living

- Monitoring the city with cameras, which ensures the safety of citizens and rapid intervention to solve any problems or risks that may arise in the city.

##### 7.1.1.5. Smart Mobility

The most emblematic dimension of Masdar City is where AI does not manifest itself as a sudden phenomenon, but rather as part of a broader, multifaceted development process.

- The first design of the city prevents the passage of cars, as the majority of private vehicles are restricted to parking lots along the perimeter of the city
- Travel will be accomplished via public mass transit and personal rapid transit (PRT) systems, with roads, light rail and a metro line in Abu Dhabi to connect Masdar City Center with the greater metropolitan area.
- In 2011, a test fleet of Mitsubishi MIEV Electric Vehicles and Fast Charge Transportation (FRT), both consisting of robotic electric vehicles, was established.

#### 7.1.1.6. Smart People

The Masdar Institute of Science and Technology is the institute that focuses on alternative energy and environmental sustainability, and is one of the forms of applying the principle of smart people in the city. Students and faculty members participate in more than 300 joint projects between academic institutions, private companies, and government agencies, where their research tends to focus on renewable energy, smart grids and smart buildings, energy policy and planning, water use and environmental engineering, and electronics.

## 7.2. Songdo, Korea

This city is called several names, including the international or smart city, and it is also known as the "gate of Northeast Asia". Located in southern Korea on the waterfront of Incheon Province, it was developed as a growth pole in the multi-center metropolitan region. In the aftermath of the economic crisis in 2007, South Korea developed a strategy to create a major hub for global business that constitutes a financial center and a center for technologies and research, focusing on technical industries and existing industries. On knowledge as the most important driving force for economic growth in Korea.

The city's area is estimated at 945 hectares, and it includes many projects under construction, including the business district, twin towers consisting of 151 floors, technical poles, research and development centers, and entertainment complexes. [17]

### 7.2.1. Applications of modern technology and artificial intelligence in the city

Smart technology applications in the city are studied within the framework of smart city components [18] [19]

#### 7.2.1.1. Smart Government

- Traffic services
- Crime prevention services
- Facilities management
- Intelligent energy management system

- Illegal parking monitoring service
- In the event of a vehicle parked illegally, the driver is informed through advertisements or SNS and directed to other public parking lots where spaces are available.

#### 7.2.1.2. Smart Economy

- Smart investment.

#### 7.2.1.3. Smart Environment

- Intelligent energy management system
- Smart waste management system “through which the waste is separated from the source and delivered directly to the processing and recycling plants and used again in energy generation”
- Environmental services and applications where sensors are installed to detect the environment in parks, shopping areas, schools, and housing areas to measure weather and atmosphere conditions. Weather sensors measure wind direction, wind speed, temperature and humidity. While the environment sensors measure the level of fine dust, carbon monoxide, nitrogen compound, sulfur oxides and the amount of ozone.
- Weather sensors on the main roads of the city.
- Prevent natural disasters

#### 7.2.1.4. Smart living

- Providing information to citizens
- Home services
- Shopping services
- Crime prevention services "During the night, surveillance cameras used to control illegal parking lots are used as closed-circuit television to prevent crime and monitor crimes."
- Health Services
- Notifying citizens automatically in the event of any natural disaster.

#### 7.2.1.5. Smart Mobility

- The traffic services

#### 7.2.1.6. Smart People

- The education and health services

## **8. Strategies and frameworks for transforming existing cities into smart cities using artificial intelligence technology**

### **8.1. The Framework Strategy (Smart City Vienna)**

The framework strategy was developed by a team of experts from the city administration and external partners. In 2013, the City of Vienna decided to create the Smart City Wien Framework Strategy, which was adopted by the City Council in June 2014. The Smart City Wien Framework Strategy sets goals for the development of the city in three main areas: resources, quality of life, and innovation. To achieve these goals, a division has been made more specific goals [20]

#### **8.1.1. The Framework Strategy Goals**

- Energy: reduce energy use per capita, and switch to renewable energy sources
- Mobility: increased support for public transport and zero-emission modes of transport such as cycling or electric vehicles, with a corresponding decrease in private vehicle traffic
- Buildings - new zero-energy building standards and renovation of old structures to reduce energy consumption from climate control and water heating by 1% per capita per year
- Infrastructure -Open government, citywide WiFi, development of 100 new applications.
- Education -Promoting comprehensive and integrated education services and encouraging the uptake of higher education options
- Research, Technology and Innovation - Attracting new research units and researchers to become one of the top five innovation sites in Europe
- Economy - Increased technology-rich exports and direct investments to and from the city
- Vienna hopes to become the city of the highest quality in Europe by 2050, while ensuring:
- Social Inclusion - City resources, affordable housing, and participation in decision-making processes will be provided equally to the full and diverse group of people living within the city
- Health care - High standards of more efficient health care will be secured for all and health literacy more widely encouraged
- Environment - Green spaces will be protected despite population growth

Obviously, Vienna's collaborative goal-setting strategy is working well. Recently, Vienna was voted the smartest city in the world by global consulting firm Roland Berger, just ahead of Chicago and Singapore from a list of 87 other cities from around the world. In the reasons for this choice, Roland Berger cites the clear goals of the framework strategy and the city's active support for pilot projects for its smart solutions.

#### **8.1.2. Vienna smart city solutions**

Digitization has entered many areas of modern life: from street cleaning, energy supply, schools, transportation to health care, food supplies, to the general administration of the city. For this to happen, relevant information and communication technology must be

available. The Vienna Digital Agenda initiative arose as a result of a collaborative process between citizens, the Vienna City Administration and entrepreneurs. over a period of several months, through an interactive online sharing platform. More than 100 well-researched ideas were presented and discussed. Where cooperation has become possible through smart technologies and a departure from traditional working methods. The city also has a large number of projects in different stages,

## **8.2. AI Strategy-The New York City Artificial Intelligence Strategy**

The overall goal of this strategy is for New York City to be equipped to meet the opportunities and challenges posed by AI with robust and inclusive actions that will support a healthy local ecosystem and work in concert to advance equality and opportunity for all New Yorkers. In a healthy ecosystem: [21]

### **8.2.1. The Strategy Component**

- Decision makers across sectors are being informed about what AI is and how it works.
- Government’s use of AI is productive, fair, accountable, and includes the public
- To share when needed.
- Industry and other organizations, such as hospitals, schools, and universities use AI responsibly, with special attention to ethics such as fairness, accountability, and privacy.
- Protect residents from harm (including disparate influence), empowered to participate in informed decision-making, and they have appropriate ways to hold institutions accountable.
- Cross-sector collaboration is actively promoted to promote learning, innovation and responsible use

The NYC Mayor’s Office of the Chief Technology Officer (NYC CTO) conducted conversations through interviews with more than fifty stakeholders, and over thirty organizations across the private, academic, and non-profit sectors. In which a wide range of topics related to AI were touched on, and the findings were organized into five thematic areas:

1. City data infrastructure (collect,store,share)
2. AI applications within the City (Environmental protection, Health and Medical Hygine, and noise- school admissions (Administrative Services, energy billing, etc.)
3. City governance and policy around AI. (Adapt models for community engagement and participatory approaches.)
4. Partnerships with external organizations.
5. Business, education, and the workforce.

### **8.2.2. Future steps**

- Modernize the City’s data infrastructure.
- Identify and pursue beneficial areas to use AI.
- Strengthen City capacity to ensure effective and responsible use of AI, including robust public engagement.

- Grow productive external partnerships.
- Protect New Yorkers’ digital rights and foster equitable opportunity across the AI ecosystem.

### **8.3. China Case [22]**

In 2017, the Chinese government announced “Next Generation A.I. Development Plan”. Concerning making China a leading nation in the A.I. industry by 2030 and focuses on building platform services in various industries such as medical, transportation, agriculture, finance, and education, centered around Chinese ICT firms .The plan included a roadmap that focused on developing A.I. technology. The Chinese government’s strategy is to strengthen private cooperation and accelerate technology development to vitalize a “National Open Platform For Next-Generation Artificial Intelligence”, It assigned specific industries to certain companies, such as, Baidu is creating an autonomous vehicle platform, and Alibaba is developing a smart city platform.

### **8.4. Agenda AI: Amsterdam Intelligence [23]**

The agenda provides a framework for:

- The use of AI for assignments within the City (AI for residents of Amsterdam) (Objective: using technology in service of Amsterdam’s residents.
- Use AI within City of Amsterdam’s processes and for projects within the city - Consolidate cooperation with the technical community, other local authorities, the market and the world of science. Develop AI competences and infrastructure within the City
- Reduce discriminatory algorithms and develop more transparent algorithms within the City itself)
- Positioning and promoting of AI and Amsterdam to develop economic potential.( Positioning and promoting Amsterdam Objective: promoting and developing an ecosystem, developing and recruiting talent - Creating awareness of and facilitating the sharing of knowledge about AI - Promoting targeted community building to boost innovation - Working to develop talent, and assisting in the process of developing and recruiting AI talent - Helping Amsterdam’s AI companies expand at home and abroad - Finding accommodation for AI start-ups and innovative SMEs)
- Establishing ethical frameworks to prevent abuse and the exclusion of certain groups of people and to actively encourage inclusion – an aspect of Digital Rights (Objective: protecting digital rights and improving equality of opportunities in Amsterdam’s algorithms - AI is subject to social, economic and ethical frameworks - To set a good example regarding digital rights as a city - To ensure transparency regarding the effects of AI on the city and perspectives for possible action in this respect)

### **8.5. Egypt National Artificial Intelligence Strategy**

Egypt’s vision is to create an AI Industry in Egypt, including the development of skills, technology, ecosystem, infrastructure, and governance mechanisms to ensure its sustainability and competitiveness. [24]

Egypt will work on the following dimensions to achieve the vision: (Egypt-National-AI-Strategy)

1. Embed AI technologies in government operations.
2. Utilize AI in key developmental sectors to make an economic impact and to solve local and regional problems in support of Egypt's sustainable development strategy and in line with the UN's SDGs for the benefit of all Egyptians.
3. Encourage investment in AI research and innovation through public-private partnerships.
4. Become a regional hub for AI education and talent serving local, regional and international market needs.
5. Support lifelong learning and reskilling programs to contribute to workforce development and sustained employability
6. Create a thriving AI ecosystem by supporting local entrepreneurship and innovation efforts, and fostering an academic scientific environment full of ideas, inventions, and discoveries.
7. Promote a human-centric AI approach where people's wellbeing is a priority and facilitate multi stakeholder dialogue on the deployment of responsible AI for the benefit of society and to inform related policy discussions.
8. Capitalize on AI as an opportunity for inclusion of the marginalized, not only for safety net programs, but also in initiatives that promote human advancement and self-development.
9. Facilitate cooperation on the Arab and African levels, working to unite Arab and African voices and efforts in AI for the benefit of all.
10. Actively contribute to global efforts and playing an active role in AI different international fora, especially around topics of AI Ethics, future of work, responsible AI and the social and economic impact of AI.

## **9. Results of the theoretical study and the case studies**

AI can be a powerful tool for smart city planning, but it also has its limitations. A SWOT analysis can be used to evaluate the strengths, weaknesses, opportunities, and threats of using AI in smart city planning.

**Strengths:** AI can be used to analyze large amounts of data quickly, providing valuable insights that can be used to optimize traffic flow, improve environmental monitoring, and increase energy efficiency. Furthermore, AI can also provide predictive modeling, helping city planners make informed decisions about infrastructure and other investments.

**Weaknesses:** One of the main limitations of AI in smart city planning is that it requires large amounts of data to work effectively. In addition, the cost of implementing AI-based systems can be high, and there is a lack of standardization in the field.

**Opportunities:** AI can be used to improve the efficiency and effectiveness of many different aspects of smart city planning, from transportation and energy management to public

safety and waste management. Furthermore, as technology advances, AI will become more powerful and cost-effective, allowing for more widespread adoption in cities.

Threats: As the use of AI increases, there are concerns about the potential for job loss, privacy issues, and the potential for bias in decision making. Furthermore, there is also a risk that AI systems may fail or be manipulated, leading to unintended consequences.

Overall, AI can be a valuable tool for smart city planning, but it also has its limitations. Careful consideration of the strengths, weaknesses, opportunities, and threats is necessary to ensure that AI is used effectively and responsibly in smart city planning.

## **10. Possibility of applying artificial intelligence technology in Egyptian smart city planning**

Artificial intelligence (AI) technology has the potential to greatly benefit smart city planning in Egypt. One way that AI can be applied is through the analysis of data from various city systems, such as traffic patterns, energy usage, and weather patterns. This data can then be used to optimize city infrastructure and services, such as traffic flow, energy efficiency, and emergency response. For example, AI algorithms can be used to predict traffic congestion and optimize traffic lights and road layouts to reduce delays.

Another area where AI can be applied in Egyptian smart city planning is in the field of urban development. AI-powered tools can be used to analyze land use patterns and population density, as well as to simulate and predict the impact of different urban development scenarios. This can help city planners make more informed decisions about where to build new housing, transportation infrastructure, and other public facilities. Additionally, AI can be used to monitor and maintain public infrastructure such as water and sewage systems, power grids and transportation, such that they are more resilient and efficient. Another way that AI can be applied in Egyptian smart city planning is through the use of smart sensors and IoT devices. These devices can be used to collect real-time data on various aspects of the city, such as air and water quality, noise levels, and pedestrian and vehicle traffic. This data can then be analyzed by AI algorithms to identify patterns and trends, which can be used to improve city services and infrastructure. For example, AI can be used to optimize the operation of public transportation systems, such as buses and trains, to improve their efficiency and reduce delays.

AI can also be used in emergency management and disaster response. By analyzing data from various sources, such as weather forecasts, social media, and sensor networks, AI systems can help city officials to quickly identify and respond to potential emergency situations. For example, AI can be used to predict and prepare for severe weather events, such as floods and sandstorms, and to coordinate emergency response efforts. This can help to minimize the impact of these events on city residents and infrastructure. Overall, the use of AI in smart city planning can help cities in country like Egypt to become more efficient, sustainable, and liveable for residents.

## **11. Discussion**

Adopting the artificial intelligent in the smart cities become an inevitable necessity, therefore every country should take serious actions to make the advantage of using AI in its cities. AI is a promising technology which can be used in various fields. Starting from managing smart homes to manage a whole country. It is can be used in city governance, smart infrastructure. AI has the potential, if used properly, can be used as a tool that enables machines to solve problems that can fix urban landscapes. We need to develop laws to organize using AI in all potential fields, which guarantee the people's safety and privacy. Investments should be directed to educate people not only for knowing how to deal with AI technology but also to develop it for their benefits. Data should be more available to everyone but should be protected in the same time. Many countries have taken steps in order to master AI technology and Egypt is one of them but there are many constraints should be faced at first such as the weakness of communications' infrastructure and research field or human capital migration.

## **12. Conclusion**

The use of Artificial Intelligence (AI) in smart city planning has the potential to improve the efficiency and effectiveness of various city services such as transportation, environmental monitoring, energy management, public safety, and waste management. However, the implementation of AI-based systems in smart cities is not without challenges.

The potential applications of AI in Egyptian smart city planning are numerous, and can help to improve the liveability and sustainability of cities. From analyzing data to improve infrastructure and services, to monitoring and maintaining public facilities, to predicting and responding to emergencies, AI technology can help city officials to make better decisions and improve the lives of residents. However, it's important to note that the implementation and successful adoption of AI in smart city planning requires a strong partnership between the government, private sector and the citizens to ensure the benefits are inclusive and equitable for all. Therefore Egypt has taken the first step to adopt AI in smart city planning by creating Egypt National Artificial intelligence Strategy.

## **13. Recommendations**

In order to adopt Artificial intelligence in Egypt; implement approaches, tools, collaborations, and governance should be made to ensure that the use of this technology is appropriate. The next steps needed to make the most of artificial intelligence, to protect people from harm, and to build a better society for all. The ecosystem approach grounded in digital rights is necessary to maximize benefits, minimize harms, and ensure the responsible application of AI. Government has to:

- Develop social, legal and ethical frameworks to get the most benefits, minimize harms, and ensure and support the responsible application of AI.
- Facilitate data access and exchange and ensure Data available to all citizens.
- Increasing talented developers' availability through education, and continuous training.
- Promoting world-class fundamental and applied AI knowledge.

- Build a strong participation between chain partners with regard to AI applications in business sectors.
- Create laws to protect the safety and privacy of the citizens and corporates.

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