

Study of the reality of smart city experience in Algeria from a developmental perspective

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Abstract :

the world has recently turned to building smart cities as a developmental trend in urbanization and achieving sustainable development goals through the use of information and communication technology applications and tools, and digitization in managing the various systems of the city. Accordingly, this research aims to study Algeria's experience in creating smart cities from a developmental perspective by addressing the concept of the smart city and the most important mechanisms that can be applied in the transition to this city, as well as presenting a number of performance measurement indicators for sustainable smart cities issued by international institutions and applicable to Algerian cities, along with analyzing the challenges and problems faced by the Algerian government in creating this project, Among the most important findings of this study is that smart cities are considered an effective developmental trend in the evolution of societies and the improvement of citizens' lives, through their reliance on the use of information and communication technology in various aspects and sectors of society. Another significant finding of this research is that the Algerian government established the smart city but did not achieve the planned results, which is due to many obstacles facing the transformation project.

Key-words: Smart cities; technological revolution; Algeria;sustainability; digitization.

Jel Classification Codes: XN1, XN2

1. INTRODUCTION:

smart cities are considered one of the modern trends in urban development, aiming to improve the quality of life and increase efficiency in managing resources and public services in cities. The Fourth Industrial Revolution and the rapid development of information and communication technology have led governments to adopt the smart city approach to solve urban problems and make them more sustainable. The rising population in cities is expected to grow, according to international reports, from 50% to 70% by 2050, within the framework of the shift towards technology and digitization in all fields, and the widespread adoption of modern technologies by governments and community members.

And Algeria, like other countries in the world, due to the development of surrounding environmental conditions, the increase in demographic growth, and the lack of sufficient administrative means to control urban expansion, has turned to establishing sustainable smart cities to address urban problems using technologies and technological applications. The aim is to

strengthen its economy and achieve development in all areas of life such as (job opportunities, health, education, transportation, environment, security, trade, economy, etc.) and also to establish a smart digital urban knowledge city that meets the needs of its residents in the fastest, least costly, and highest quality manner. However, those following the smart city project in Algeria notice that this digital transformation from the traditional model to the smart model in managing cities in Algeria has faced many challenges and problems, which have hindered the completion of this project.

Accordingly, the issue raised in this research paper is as follows:

-What is the reality of smart city management in Algeria from a developmental perspective? And what are the main challenges it faces ?

We tried to address this issue through the following hypothesis:

-The transition towards smart cities in Algeria requires building a comprehensive and integrated strategy centered on balancing the economic, technological, social, environmental, and institutional aspects.

- Importance of the study:

The importance of the study stems from the significance of the topic it addresses, which is related to the transition towards smart cities in Algeria. This topic has recently garnered considerable attention from countries, as smart cities are fundamental to achieving sustainable development goals and meeting the needs of both citizens and the government.

- Study Objectives: This study aims to the following:

- Study the concept of smart cities, as well as the most important mechanisms and technologies for transforming into smart cities from a modern developmental perspective.

- This study also aims to identify and analyze Algeria's experience in transitioning to smart cities.

- Study methodology:

To analyze this study, we relied on the descriptive and analytical methodologies to study and analyze the term "smart cities" and the main mechanisms that underpin it theoretically. The descriptive methodology was also used to study Algeria's experience in transitioning to a smart city, focusing on the key foundations and pillars that supported this transformation.

2.The nature of smart cities

2.1 Definition of a smart city :

Recently, there has been an increasing interest in the term "smart cities," which intersects with various concepts such as digital cities, electronic cities, and cognitive cities. There is no unified definition of a smart city among researchers, but it can be simply defined as a smart city that includes a neighborhood, municipality, county, region, or urban area, with governing authority over that area. A smart city is based on an infrastructure of communication and information networks that enable efficient city management, enhance economic development and sustainability, improve the quality of life for citizens, and create a stimulating digital environment for education and creativity. (Al-Rou'uf, 2018, pp. 55-56.)

A smart city is defined as the use of information technology, data analysis, and software with the aim of improving infrastructure and public services, and working more efficiently and effectively with citizens. The concept of a smart city is based on urban development, manufacturing, and information technology in various fields of government services provided to community members, such as education, transportation, healthcare, food security, and public service. (UNESCO, 2015, p. 594)

Accordingly, it is clear that the smart city relies on the use of technologies and electronic applications in many fields, such as transportation and mobility, security and safety, healthcare, energy and water, and community and culture. Smart cities also aim to achieve many goals, such as urban planning organization, improving quality of life and services, enhancing security and protection, saving effort and time, and improving the city's sustainability. Thus, a smart city is realized when it relies on digitization and a wide network of communications and information, focusing on economic development and investments, and striving to improve the quality and standard of living and the rational management of available resources. In other words, a smart city is based on the idea of interaction, integration, and effective connectivity between the following dimensions: the urban system, the technical and technological dimension, the economic and social aspect, and the institutional and environmental dimension within a sustainable framework.

3. Foundations of building a smart city

3-1 Mechanisms for the transition to smart cities

Transforming a city into a smart city from a developmental perspective requires many mechanisms and technologies, which represent six essential components of a smart city according to the European Union, as follows:

Smart transportation: the management of the transportation and traffic system through a set of technologies and applications that rely on information technology. Smart transportation includes fast and cost-effective transportation systems for citizens with easy access to internal areas, safe and sustainable transportation systems, and increased efficiency and intelligence of transportation and transit systems.

-Smart Economy: The economy in a smart city must be based on digitization and electronic transactions, aiming to increase local and global productivity and competitiveness, international integration, and should focus on innovation and creativity, attracting investments, and labor market flexibility.

-Smart People: It is considered one of the essential pillars in shaping the smart city, so the city's residents must participate significantly in achieving the smart city goal and public life, and they should have the ability to innovate and learn sustainably, in addition to being characterized by openness, social diversity, and acceptance of others.

-Smart Governance : It involves developing the government work system through the use of the internet and digital technology to create an advanced administration characterized by

participation in decision-making, transparency in work, providing public services electronically to citizens, and management based on clear strategies and political visions.

-Smart Environment :Sustainable development should be the foundation for developing a smart city. Therefore, the city must focus on managing natural resources and protecting the environment properly, combating pollution, rationalizing water consumption, and relying on renewable energy.

-Smart Living: It includes a range of activities that contribute to providing a good quality of life, where all residents of the smart city can enjoy a high level of health and education, personal safety and culture, housing quality, and all services must be easily accessible to the residents. (Giffinger, 2007, pp. 11-13)

These aforementioned mechanisms are also used as indicators to measure the government's success in achieving the smart cities project and its developmental goals. Additionally, there are other international indicators used as a tool to evaluate and measure the government's success in establishing smart cities.

4. Indicators for measuring the sustainable smart city:

4.1 Axis for measuring sustainability standards for the smart city:

The indicators for measuring smart cities, whether international or local, fall under this axis, meaning they include key elements to measure the progress rates of cities in the economic, social, environmental, cultural, and sustainability fields, and generally in various aspects of life. In this context, five main aspects have been formulated as indicators to measure the level of smart city quality, which are as follows:

- **The economic aspect**: It is represented by the ability to create income and provide job opportunities, and it encourages investments to ensure the quality of life for the residents.
- **The social aspect**: The state must be able to provide welfare and safety, health, and education for citizens and achieve social cohesion.
- **Environmental aspect**: Protecting natural resources and ensuring their sustainability for future generations.
- **Governance**: the ability to ensure stability, achieve democracy, participation, and justice in society.
- **The cultural aspect**: the ability to enhance the cultural values of society.

4.2 Residents' evaluation of smart city elements

In this axis, the success of the smart city model is measured through surveys that assess residents' opinions and evaluations of various outputs and services provided by the smart city, such as the role of technology in addressing urban challenges, their perceptions of the available electronic applications in their city, the speed of digital transformation and internet flow, and the quality of services provided electronically.

3.3 Measuring the efficiency and development of the technology used in the smart city, and the extent of progress in relying on the infrastructure and applications specific to smart cities in various aspects of life.

This indicator measures the efficiency of the application and development of technology used in smart cities, the level of progress brought about by infrastructure and communication networks, the accuracy of data collection and analysis platforms in various sectors, and the extent of citizen participation in decision-making through the digital platform. (Ahmed, 2024, pp. 65-66)

By studying and analyzing these indicators, we find that they align with the study and analysis of the reality of the smart city transformation experience from a developmental perspective in the Arab region in general and Algeria in particular.

5. Analyzing the reality of Algeria's experience in creating sustainable smart cities

Modern trends in construction and urban development aim to achieve dimensions of sustainable development in the city, such as improving the quality of life for community members, better consumption of natural resources, and economic development. Algeria, like other countries around the world, has sought to adopt sustainability standards and the concepts of the Fourth Industrial Revolution in planning and construction in order to create sustainable smart cities.

5.1 Smart cities and the Algerian reality

In the context of technological transformations in the surrounding environment, the Algerian state has adopted a developmental strategy related to the creation and modernization of smart cities, choosing digitization as a central policy to support its project in establishing these cities. In this context, the government launched a project named "Algeria: A Smart City" in 2018. This project aims to involve all administrations such as transportation, energy, urban planning, water, security, health, and startups by using information and communication technology between sectors to collect and utilize data in building smart cities. The project for creating smart cities has also been supported by a series of regulatory laws, the most important of which are as follows:

- The law related to the establishment of new cities in 2002.
- The Environmental Protection Law within the framework of sustainable development of 2003.
- Law on Regional Planning and Sustainable Development for the year 2020.
- Law on the Promotion of Renewable Energies within the Framework of Sustainable Development of 2009.

In addition to this, a set of laws has been drafted to conduct transactions and provide public services to citizens electronically in all administrations, such as the trade sector, postal and transportation services, justice, security, education, and local administration. Furthermore, more than 100 startups and companies specialized in digital technology have been involved to support the Smart Algeria project. In this context, the Algerian government has worked on building distinguished technological and health hubs in the city of Sidi Abdallah, which considered the first experiment of a smart city and technological hub in Algeria. (Rezki, 2025, pp. 45-47) These hubs are based on the following smart city foundations:

-Transportation sector: The Ministry of Transportation in Algeria has launched the "Smart Traffic Signals" project to facilitate transportation and traffic flow and reduce congestion. This system, which includes more than 500 intersections in the capital, also provides an electronic portal for bus and taxi owners to submit their accreditation and licensing requests online.

- The commercial aspect: The Ministry of Commerce has established electronic records with the aim of modernizing the sector, which will allow for the completion of commercial transactions electronically. It has also implemented an encrypted code containing all the trader's information.

- Housing sector: The Ministry of Housing has implemented electronic registration and digitized all housing applicants' files.

- At the technological level: A technology center was launched in June 2018 in the capital of Algeria to transform the city into a smart city.

- Renewable energies: Algeria has launched programs to develop renewable energies, and the government's vision is based on a strategy centered around valuing renewable resources. The state has also approved the national program for the development and promotion of renewable energies within the framework of sustainable development, in addition to a waste treatment facility. (Ilham, 2022, pp. 522-523) . The Algerian government has also turned its attention to green economy, which focuses on the natural ecosystem.

After studying the reality and efforts of the Algerian government in the field of creating a smart city, and according to the International Institute for Administrative Development's report for the year 2025 and the indicators adopted by the institute to measure the level of smart cities, which focus balancedly on the economic, technological, environmental, and socio-cultural aspects of smart cities on one hand, and the extent to which human dimensions such as improving quality of life, sustainability, inclusivity, and justice are achieved on the other hand. The opinions of about 100 city residents were also surveyed regarding the structural pillars that refer to the current infrastructure of the cities and the extent of technology application in their city and the services provided to residents. Additionally, five main areas were evaluated: health and safety, mobility, activities, job opportunities, and governance. According to these indicators, Algeria ranked 128th out of 146 cities worldwide and second in Africa for the year 2024 . (Smart city index 2025, 2024)

From here, it becomes clear that despite the efforts and developmental projects initiated by the Algerian government to create smart cities and move away from traditional living patterns to a smart model based on information and communication technology, the planned results have not been achieved. Algerian cities still suffer from the absence of smart transportation, the spread of environmental pollution, and the lack of smart applications and systems in the health and security sectors, as well as other government sectors. Additionally, some administrations still rely on paper-based management and the traditional model in providing services to citizens, with a lack of smart city culture among the Algerian community. And all of this is due to the presence of a set of obstacles that stand in the way of achieving the smart cities project in Algeria, the most important of which are as follows:

-The financing problem in the field of smart city development: One of the main challenges facing the Algerian government in the field of creating sustainable smart cities is the financing of basic developmental projects, which involve building the infrastructure for information and communication technology and digital systems to transform the traditional city into a smart city. This requires massive investments and significant financial costs.

-The Algerian government's lack of a legal framework to regulate the transition to sustainable smart cities: The strategy for creating smart cities in Algeria lacks a legal framework that governs the transition to smart urbanization, especially since the existing urban planning and construction laws and regulations do not keep pace with modern urban trends and the foundations of smart cities and the Fourth Industrial Revolution.

-Planning and technical challenges: The project of creating a smart city in Algeria suffers from the lack of a strategic vision and a clear concept of the smart city. Projects based on communication technology and major infrastructure require correct decisions, technical staff, and a technical reference that defines the standards and regulations for building the infrastructure, as well as all the devices and plans necessary to manage the sustainable smart city that meets the needs of the residents. Smart planning makes it easier for managers to achieve the goals of a smart city and avoid falling into problems. The Algerian government lacks all these points and is characterized by poorly thought-out planning, unclear policies, and an inability to control information and communication technologies related to the creation of smart cities. (Boutaraf, 2021, pp. 1372-1373)

-Weak use of technology in sectors and the level of services provided to citizens: Government sectors in all fields still suffer from following traditional methods in completing administrative transactions and providing services to citizens, with a lack of coordination between departments. Additionally, there is a weakness in human resources capabilities in the field of digitization and the unpreparedness of infrastructure supporting the concept of a smart city. Furthermore, we find that the Algerian citizen lacks the culture of transformation and coexistence with the mechanisms of the smart city in their daily life.

Based on this, Algeria needs a comprehensive strategy to transition to the concept of a smart city, such as: having supportive legal regulations for this transformation, re-evaluating urban planning and construction laws in Algeria, as well as collaborating with the private sector and international companies in this field, since the private sector plays a significant role in enhancing access to smart cities. Additionally, there should be efforts to generalize the use of electronic applications in various public administrations to meet the needs of the population as quickly and efficiently as possible. This can be achieved through the development of telecommunications infrastructure and the digitization of all government sectors.

6.Conclusion:

Given the good environment and better living standards that smart cities provide in all aspects of life, and their ability to offer all services to institutions and individuals electronically, as well as their importance in solving urban problems, the Algerian government has adopted this developmental trend and shifted towards smart cities to achieve sustainable development goals at

the beginning of the new millennium. Through our study of this experience, the researcher reached a set of results and recommendations as follows:

Study results:

- There are several definitions of the concept of smart cities, but most of them agree on the balance between the economic, social, institutional, environmental, technical, and technological aspects in the concept of a smart city.
- Smart cities are considered an effective developmental trend in modernizing society, improving the lives of citizens, and meeting their needs in all areas of life with high quality. The transition to smart cities depends on the state's ability to efficiently use information and communication technology.
- Algeria has turned to adopting smart city projects, but it has not achieved the planned results. This is due to many challenges facing the transition to a smart city, the most important of which are the unprepared infrastructure supporting this transition and the lack of funding especially since the smart city project requires large financial amounts.
- The Algerian government lacks a legal regulatory framework in the field of urban planning that supports the transition towards smart cities, as well as cooperation and the absence of coordination and joint integration among different government entities, in addition to the lack of awareness and culture among citizens in using digital services for their daily activities.

Recommendations:

- For the Algerian government to successfully implement the smart city project, it must have the political will along with clear strategies, policies, and laws supporting the establishment of smart cities, and create a responsible body of experts and specialists to oversee this project.
- The process of transforming into a smart city in Algeria requires financial funding that must be provided by both the public and private sectors, where both parties benefit from the transformation in terms of citizen satisfaction with their government and increased investments for the private sector.
- There must be an enabling environment in Algeria that supports the creation of sustainable smart cities by harnessing all material and human resources and developing the information and communication technology infrastructure, in coordination and collaboration with the private sector and international companies in this field.
- It is essential to focus on the rehabilitation of human resources, which is one of the most important factors for the success of smart cities in the field of information and communication technology, and to work on developing smart applications in all areas of life (health, security, transportation, etc.) to improve the lives of citizens and provide them with public services via the internet.
- The Algerian government should transition towards a green economy that is environmentally friendly, invest in renewable energies, protect the environment, and combat pollution.

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