Contents lists available at IJIEOR
International Journal of Industrial Engineering and Operational Research
journal homepage: http://ijieor.ir
Volume 6, No. 1, 2024

Investigating the Use of Information and Communication Technology in the Design of a Smart City in the 22nd District of Tehran (SWOT Analysis)

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ARTICLE INFO

Received: 2024/04/15

Revised: 2024/05/25

Accept: 2024/06/11

Keywords:

Design, Smart City, Communications and Information, Internet of Things, Artificial Intelligence, SWOT.

ABSTRACT

Smart city is an emerging phenomenon in city development. It is used geographically for smartness in intelligent cities, using modern technologies and technologies such as the Internet of Things (IoT), artificial intelligence (AI), and information systems. These technologies lead to better and more efficient energy management, transportation, waste, and water resources. Urban resources help in intelligent cities. It also increases efficiency, reduces resource wastage, and improves the citizens' quality of life. The smart city collects comprehensive data and uses them to make optimal decisions. With the smartening of cities, citizens can effectively communicate with the urban environment. They will have easy and intelligent access to public services. Also, sustainable development, air pollution, traffic reduction, and urban safety improvement are other advantages of the smart city. The metropolitan population, the need for optimal management of resources, and the use of new technologies in the design and management of cities have become very important. This article examines the use of information and communication technology (ICT) in designing and implementing a smart city in the 22nd district of Tehran. Using new concepts and technologies, this area can become an intelligent city that optimizes resources and improves citizens' quality of life.

1. Introduction

Several things can be said when discussing the goal of creating a smart city (Smart City). Knowing these goals will undoubtedly be very useful in developing smart cities. The purpose of making

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Available online 06/12/2024
2676-3311/BGSA Ltd.

such a city is to create a system of several different systems. The performance of each of these subsystems will be necessary for the optimal performance of the final system. Cities' structured and systematic nature optimizes various city functions, and their efficiency increases accordingly. More efficiency will have great results on the comfort of the citizens of a city [1-2].

The higher efficiency of various urban systems makes people experience a good life and great prosperity. The main goal of Such a city is to reduce the side costs of maintaining cities. This way, governments can save on expenses and spend on other sectors. On the other hand, citizens in such Cities can save time and money. As the beating heart of smart cities, information and communication technology (ICT) is critical in optimizing energy consumption, reducing pollution, improving public transportation, and increasing citizens' quality of life [3]. District 22 of Tehran has a high potential to become an intelligent city with proper infrastructure and development plans. This article examines how to use ICT in this area and analyzes the results and suggestions to improve the current situation. Among the most important technologies used in the 22nd district of Tehran today, the following can be mentioned:

Artificial intelligence

It is a technology that can process and analyze the collected data and provide deep insight into these data. This technology can be used to make different activities and functions smarter. Intelligent cities are used to reduce the need for the workforce to perform repetitive activities to a great extent [4].

Cloud computing

When storing large amounts of data in smart cities, cloud computing is the best and perhaps the first option that comes to mind. Cloud computing is a service that allows information and data to be stored and processed in a third-party environment.

Machine learning

Machine learning is one of the new technologies and sub-branches of artificial intelligence. This technology can teach different machines and devices to think and act like humans. In this way, they can increase the accuracy of activities and, on the other hand, perform the required processes at a higher speed.

Internet of Things

One of the essential applications of the Internet of Things (IoT) is in smart cities. IoT includes a variety of sensors and machines that can perform various activities within intelligent towns. Sensors can receive and store different information. Operating machines and arms can also perform multiple operations and functions automatically without human supervision.

Security technologies

When it comes to smart cities, the issue of security becomes more critical. Today's security technologies can increase the security of equipment and other technologies used in smart cities and prevent security problems in these cities [5-6].

2. Theoretical

A smart city is a city that uses new technologies to optimize energy consumption, reduce pollution, improve public transportation and increase the quality of life of citizens. ICT, as the foundation of an intelligent city, provides the possibility of collecting, analyzing and using extensive data. Key technologies include the Internet of Things (IoT), Big Data, Artificial Intelligence (AI) and Geographical Information Systems (GIS) [6-7].

3. Methodology

Mixed methods were used to investigate the use of ICT in Region 22, including document review, interviews with experts, and analysis of collected data. Also, examples of successful projects in other smart cities were examined. The title of the model was examined.

Analysis and findings

Intelligent transportation systems

Using sensors and real-time data to manage traffic and optimize routes. Using sensor data, intelligent transportation systems can help reduce traffic and improve transportation flow. In Region 22, traffic can be managed in real-time by installing traffic sensors and using clever algorithms.

Smart energy management

Implementation of smart electricity networks and use of renewable resources. Intelligent electricity networks help to optimize energy consumption by using energy consumption data. In Region 22, installing smart electricity networks and using renewable energy such as solar and wind can improve energy consumption and reduce Paid expenses [7-8].

Smart waste management

Applying IoT technologies to collect and manage waste efficiently. Utilizing sensors installed in waste tanks and smart algorithms, waste collection can be optimized, preventing pollution. In Region 22, installing these sensors can help improve waste management [8-9].

Smart urban services

Creating online platforms for easy access to city services such as school registration, bill payment and public service requests. These platforms can help reduce the time and costs of municipal services. In Region 22, creating these platforms can improve the quality of services provided to citizens.

Smart security and monitoring

Smart surveillance cameras and video data analysis can be used to increase urban security. By using advanced technologies in urban surveillance, crimes can be prevented, and public security can be improved. In District 22, installing smart surveillance cameras can help increase security [8-10].

4. Results of smart cities in the world

Today, many cities worldwide have started using intelligent technologies and are on the way to becoming smart cities. However, some towns move much ahead of others, among which the following can be mentioned:

Table A: List of smart cities

Country	City
Spain	Barcelona
State of Ohio, United States of America	Columbus
Emirate	Dubai
China	Hong Kong
The United States	Kansas City
Australia	Melbourne
The United States	New York city
The United States	San Diego
Japan	Tokyo

Country	City
Canada	Toronto
Austria	Vienne

The city-state of Singapore is known as one of the world's leaders in creating brilliant cities. In this state, various cameras based on the Internet of Things monitor traffic as much as possible. This city has systems for monitoring energy consumption, waste management, water consumption management, etc.

San Diego is another city where more than 3,200 sensors are used to optimize traffic flow, parking, etc. It is also used to increase public safety. In Dubai, there are traffic management and monitoring systems, and modern technologies are used in various fields, such as intelligent buildings, urban services, and education.

5. Results

District 22 of Tehran, as one of the new and developing areas, has a high potential to become a smart city. According to the existing infrastructure and development plans, this area can become a successful example of an intelligent city. District 22 of Tehran Municipality is located northwest of Tehran city with an area of about 54,000 hectares (including the heights). This area is located in the north. It is bounded by the central Alborz Mountain, in the east by the boundary of the Kan River, in the south by the Tehran-Kar highway, and in the west by the forests of Vardvard, and it is adjacent to areas 5 and 21 of Tehran municipality. This research analyses the factors affecting sustainable development and knowledge-based urban planning, including income sources, which are the most influential factors, through descriptive data analysis (SPSS software), descriptive statistics and inferential studies.

Table 1: Strengths (S)

Row	Agents	Coefficient	Score	Multiplication
1	The existence of a network of main road	0.05	3	0.15
2	Suitable weather	0.06	3	0.18
3	Construction of Chitgar Lake (Fars's golf)	0.05	3	0.15
4	The presence of extensive green spaces in the region	0.05	3	0.15

Row	Agents	Coefficient	Score	Multiplication
5	Implementation of the Hezar-o-yek shab project as an international cultural and entertainment centre	0.04	3	0.12
6	Existence of suitable conditions for the development of tourism	0.06	3	0.18
7	Proximity and neighborhood with Mehrabad and Emam Khomeini Airport	0.04	3	0.12
8	Suitable conditions for the construction of a technology town	0.03	3	0.09
9	The possibility of earning income from medical tourism (professor Samiee Hospital)	0.04	3	0.12
10	The possibility of earning income from Vojood sports tourism (Azadi sports centre)	0.04	3	0.12
11	The possibility of holding international conferences) away from Tehran's traffic)	0.05	3	0.15
	Total	0.51	33	1.53

Table 2: Weaknesses (W)

Row	Agents	Coefficient	Score	Multiplication
1	Selling a large portion of real estate assets	0.05	2	0.1
2	A high percentage of the region's income from the sale of low taxes	0.04	2	0.08
3	The high percentage of the region's income is due to the effects of changing users	0.04	2	0.08
4	High density of buildings in and around Chitgar Lake	0.04	2	0.08
5	Appointing managers based on a predetermined goal	0.03	2	0.06

Row	Agents	Coefficient	Score	Multiplication
6	Applying the basic opinion based on the decision of the centre on the profitable sectors	0.05	2	0.1
7	The use of twenty-five percent of the region's lands by the armed forces	0.02	2	0.04
8	Rent and influence in the implementation of essential projects in the region	0.03	2	0.06
9	The weakness of the region in attracting the participation of the private sector	0.03	2	0.06
10	Changing the approved uses due to the lack of recognition of future (daily) needs.	0.04	2	0.08
11	Lack of planning and investment to create continuous sources of income in the region	0.03	2	0.06
12	Failure to use expert forces and scientific capacities	0.05	2	0.1
13	Short managerial life	0.04	2	0.08
	Total	0.49	26	0.98

Table 3: Opportunities (O)

Row	Agents	Coefficient	Score	Multiplication
1	Investing in small industries according to the land test plan through investment funds	0.03	3	0.09
2	Waste recycling and sales	0.05	3	0.15
3	Hospitalization and utilization of the economic capacities of tourism	0.04	3	0.12

Row	Agents	Coefficient	Score	Multiplication
4	Increasing the municipality's share of value added tax	0.05	4	0.2
5	An increase in the rate and basis of renovation charges	0.05	4	0.2
6	Communicating and developing relations with developed cities	0.03	3	0.09
7	Obtaining a loan from the World Bank by Bank Shahr	0.04	3	0.12
8	Development and improvement of metro and public transportation	0.03	3	0.09
9	Compilation of the five-year plan of the municipality	0.05	3	0.15
10	The local nature of municipal responsibility and municipal duties (local government)	0.04	3	0.12
	Total	0.46	35	1.48

Table 4: Threat (T)

Row	Agents	Coefficient	Score	Multiplication
1	Weak governance of participatory management	0.06	2	0.12
2	Weakness of locality management organizations	0.04	2	0.08
3	Non-compliance with municipal rules and regulations	0.06	2	0.12
4	The inappropriate process of outsourcing municipal services to city electronic service offices	0.04	2	0.08
5	The government's resistance to increasing the municipality's share of value-added tax	0.05	2	0.1

Row	Agents	Coefficient	Score	Multiplication
6	The government's resistance against increasing the municipality's share of the public budget (decreasing the municipality's share of the government's credits)	0.05	2	0.1
7	The traditional view of parliamentarians to the municipality of big cities	0.04	2	0.08
8	Allocation of the municipal budget by the government to other departments	0.04	2	0.08
9	Weakness in attracting private sector participation	0.02	2	0.04
10	The application of personal intention in the election of the mayor by council representatives instead of national interests	0.03	2	0.06
11	Unconventional reliance on the unstable income sector	0.02	2	0.04
12	Lack of efficient management and planning for cost management and investment in earning income	0.02	2	0.04
13	Assigning the provision of urban needs without budget allocation	0.03	2	0.06
14	Carrying out parallel actions with other bodies on behalf of the municipality	0.04	2	0.08
	Total	0.54	28	1.08

Table 5: Variable descriptive statistics

SWOT	Number	Average	Middle	Standard deviation	The lowest amount	The maximum amount
Strengths	400	4.13	4.12	0.562	2.38	4.88
Opportunities	400	3.97	4.00	0.877	1.29	5.00
Weaknesses	400	4.11	4.12	0.913	1.25	5.00
Threats	400	4.05	4.00	0.907	1.22	5.00

6. Analysis

Smart Transportation in Region 22

In District 22 of Tehran, traffic sensors and intelligent transportation systems can be managed in real-time, and the transportation flow can be improved. Using sensor data, these systems can help reduce traffic and improve transportation flow.

Smart Energy Management in Region 22

In Region 22, it is possible to improve energy consumption and reduce costs by installing smart electricity networks and using renewable energies such as solar and wind. These smart electricity networks help to optimize energy consumption by using energy consumption data.

Smart Waste Management in Region 22

In area 22, using sensors installed in waste tanks and intelligent algorithms, waste collection can be optimized, and pollution can be prevented. Installing these sensors can improve waste management help.

Smart Urban Services in Region 22

In Region 22, creating online platforms for easy access to municipal services can improve the quality of services provided to lead citizens. These platforms can help reduce the time and costs of municipal services.

Smart Security and Surveillance in Region 22

Installing smart CCTV cameras in District 22 can help increase security. Using advanced technologies in urban surveillance can prevent crimes and improve public safety.

Challenges and limitations

1. High costs: Implementing innovative technologies requires significant investments, which can be challenging.
2. Insufficient infrastructure: Some areas may lack the necessary infrastructure for implementing innovative technologies.
3. Resistance to change: Some citizens and managers may be against changes and use new technologies to show resistance.
4. Security and privacy issues: Wide use of data and sensors may bring security and privacy.

7. Conclusion

Using ICT in the design and management of the smart city in the 22nd district of Tehran can significantly improve the quality of Citizens' lives and resource productivity. Considering the existing infrastructure and development plans, this area has a high potential to become a successful example of an intelligent city. Investing in infrastructure, ICT, education, and awareness among citizens, as well as creating interdepartmental cooperation, can help develop and implement intelligent projects in this region.

Offers

1. Investment in ICT infrastructure: creating high-speed and stable Internet networks and developing Smart platforms.
2. Education and awareness: training citizens and government employees about the benefits and how to use innovative technologies.
3. Inter-sectoral cooperation: creating extensive collaboration between public, private and academic sectors to develop and implement intelligent projects.
4. More study and research: Conduct more research to identify the specific needs and problems of Region 22 and provide appropriate solutions.
5. Maintaining security and privacy: creating appropriate regulations and standards to maintain security and privacy. Private data collected from intelligent systems.

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