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APPLICATIONS OF DIGITAL MODELS IN INTEGRATED MANAGEMENT IN SMART TOURIST CITIES: AQABA CITY OF JORDAN AS A CASE STUDY

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Abstract: This study focused on highlighting the most important virtual technological applications at the global level used in the growth and development of tourist cities, by reviewing the most important technological means used in managing smart tourist cities and the conditions and procedures that must be provided in the urban transformation in tourist cities from their traditional framework to the digital framework that keeps pace with global developments in the digital tourism industry and meeting the requirements of sustainable tourism development by focusing on the city of Aqaba in Jordan. The study found the importance of adopting digital models with their multiple applications in providing sustainable management in tourist cities and transforming them into competitive digital tourist destinations and giving them comparative advantages in light of the rapid development at the international level in the growth and development of a high-end tourism industry.

Key words: digital models, smart cities, integrated management, e-tourism, virtual tourism

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INTRODUCTION

The world is currently moving in an obvious and clear way in managing many economic sectors relying on knowledge economics. The tourism sector is one of the most important global economies that lead the global economy today (Khan et al., 2020). Especially in light of the increasing acceleration in the means of obtaining knowledge and the transformation towards the digital world (Hojeghan and Esfangareh, 2011), which led to the expansion of the tourism and travel market and the creation of new tourist cities (Capocchi et al., 2019). The shift has become clear in the management of these tourist cities from the traditional approach to the adoption of the integrated sustainable management approach (Meredith, 2011). This shift is based on the provision of digital applications in the management and development of tourist cities until these cities are called "smart tourist cities (Yovanof and Hazapis, 2009; Jawabreh, 2020; Nam et al., 2021). This study mainly focuses on addressing the concept of smart tourist cities and the reasons for the delay in the existence of this type of city at the Arab level in general and Jordan in particular. Therefore, the study tries to rely on the most important digital models used globally in integrated management in the growth and development of tourist cities and try to apply these models in the form of a proposed system in creating urban transformation in the management and development of tourist cities through the application to the city of Aqaba in Jordan. Accordingly, the study problem can be addressed by answering several questions as follows:

1. What are the most prominent digital models used in the management of smart tourist cities.
2. What are the most important technological applications used in integrated tourism management in smart tourist cities.
3. What are the comparative and competitive advantages of applying digital concepts and models in the development and planning of tourist cities?

This study aims to clarify the mechanisms and requirements for the transition from the framework of traditional tourist cities to smart tourist cities, to clarify the most important digital models used globally in smart tourist cities, and to show the most important benefits of adopting the concepts of integrated management in smart tourist cities. It also aims to study some global experiences to benefit from them in transforming the cities into a smart city. This study also aimed to formulate a proposed methodology to transform the city of Aqaba into a smart tourist city. It is based on a few justifications, highlighting the need for this type of applied study in the management and development of tourist cities to become able to compete at the global level. Among the most prominent justifications of the study:

1. Not applying the concepts and models of smart tourist city management in the study area.
2. The need for sustainable development by enabling tourist cities with accelerated technological means.

Study Methodology

The study is based on a working methodology represented by models and proposed technological systems that can be

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applied to the study area - the city of Aqaba in Jordan - with the aim of converting it into a smart tourist city, by relying on interactive technologies such as Wi-Fi, geographic information systems (GIS) and Remote Sensing (RS), Bluetooth technologies, GPS technologies, tablets (RFID), and reversible devices (NFC) (Oppermann, 2009; Huang et al., 2017; Dragović et al., 2018; Mahmoud et al., 2021). Based on the foregoing, the study relied on the use of the systemic approach based on analyzing the elements of the study focused on the inputs, processes, and outputs of smart applications in the management of tourist cities. To achieve the objectives of the study and answer the questions, the study relied on digital tools and models used in many smart tourist cities at the international level, and trying to benefit from them by applying them in the study area, and simulating these global experiences. In providing integrated management in transforming the city of Aqaba into a smart tourist city.

STUDY AREA

The study area (Aqaba) is located in the south of the Hashemite Kingdom of Jordan, 330 km from the capital Amman. The city of Aqaba is one of the sides of the Golden Tourist Triangle in southern Jordan, and the only seaport of Jordan on the Red Sea and one of the distinctive tourist cities on the Red Sea coast. Aqaba Special Economic Zone (ASEZ) was established in 2001 as a tourist development zone exempt from customs and taxes. The city contains an international airport - King Hussein International Airport - and many tourist and hotel facilities.

LITERATURE REVIEW

Previous studies that dealt with digital applications in smart tourist cities are characterized by their scarcity at the international level (Droege, 2016; Komninos, 2016; Gretzel et al., 2015; Chigon, 2013; Correia, 2011; Hodgkinson, 2011; Giffinger et al., 2007). Most of the studies dealt with smart cities in their general form (Komninos, 2010, 2012, 2013, 2016), without focusing on tourist cities and villages, especially in the Arab world. As for Jordan, there are no studies about the current study. Therefore, a number of international studies can be viewed (Radovanović, 2015; La Rocca, 2014; Lee, 2011; Asgharizadeh et al., 2009) with the aim of identifying the most prominent applications of digital models in integrated management in smart tourist cities (Steventon and Wright, 2016; Spadoni et al., 2011), while trying to simulate these digital applications in dropping them on the city of Aqaba, with the aim of transforming it into the ranks of smart tourist cities. The study of Buhalis and Amaranggana (2013) entitled "Smart Tourism Destinations" is one of the most prominent studies that dealt with smart tourist cities as attractive destinations for tourists, by taking advantage of the successive technological developments in the tourism industry. The study aimed to take advantage of technological applications in managing the tourism industry. Tourist cities create competitive advantages and achieve economic savings. The study reviewed the most prominent existing challenges facing smart tourist cities and trying to address them using flexible applications in managing smart tourist cities. The study of La Rocca (2016) titled "The Role of Tourism in Planning the Smart City" focused on many problems experienced by traditional cities such as congestion, pollution, informal housing, and poor sustainable management in urban areas. Therefore, the study focused on the importance of adopting technological applications in managing cities and making them digital tourist destinations.

The urban system, with all aspects represented by the economy, transport, and the environment, needs to be rehabilitated through the introduction of the smart tourism industry, the development of sustainable urban systems, and the focus on renewable resources through strategies based on digital systems in the management of smart cities. The study concluded that the global applications of urban cities in the world are based on criteria, the most important of which are: digitization and technological development in the city, and the extent to which tourism contributes to the functions of the urban city, in addition to other factors represented by the elements of natural, economic and social sustainability in the management of smart cities.The study of Gretzel et al., (2015), entitled "Conceptual foundations for understanding smart tourism ecosystems", it focused on the concepts of managing natural ecosystems in tourist cities using smart technology by adopting the idea of a digital ecosystem that is compatible with the requirements of sustainable tourism in cities. The study revealed the importance of adopting technological systems in tourist cities and transforming them into smart cities in order to provide optimal management of the ecosystem, based on rationalization and good management of resources, which leads to an increase in the competitiveness of smart tourists cities. This study complements previous studies to build a conceptual framework for the development of digital models that can be used in tourist cities, and an attempt to convert them into smart cities. Therefore, the multiple methodologies used in previous studies will be relied upon in an attempt to adapt them to suit a proposed system for transforming the city of Aqaba into a smart tourist city.

The proposed systems for transforming the city of Aqaba into a smart tourist city

Several international reports issued by the United Nations, especially those issued by the World Tourism Organization (WTO), indicated that the world is heading strongly in the twenty-first century to develop the tourism industry as one of the most important sectors that are currently driving the global economy. Therefore, many tourist cities began to expand and grow at rapid rates, which led to the emergence of many problems related to the management of natural, economic, and social resources in these cities. In order to find solutions, a shift has begun from the traditional model of managing tourist cities to a digital one that relies on information and communication technology in developing the tourism infrastructure, the tourism superstructure, and responding to all variables. The term "digital or smart tourist city" is one of the modern terms, which includes a strategy based on two areas in the management of the tourist city, namely:

1. The first field includes the development of digital city strategies represented by the computerization of all areas of services provided to tourists, such as hotels, tourist offices, car rental offices, medical and environmental tourism areas, and heritage and archaeological sites.

2. The second area is based on empowering local communities to shift from the traditional to the digital mode, where the residents of the tourist sites are characterized by the high ability to adapt to all developments, so the concepts of participatory and enabling digital business incubators are applied here, which leads to enhancing the concepts of the sustainability of the tourism product in terms of environmental, economic and social, as shown in Figure (1).

Figure 1. Sectors involved in smart tourist cities system (source: elaborated by the researchers)

Figure 2. Digital data base required for transforming smart tourist cities (Source: elaborated by the researchers)

One of the most important requirements for smart applications in the administration of the city of Aqaba is the availability of electronic databases, which are based on Geographic Information Systems and the Global Position System. These systems provide spatial databases linked to a metadata table for all the contents of the city, including tourist institutions, archaeological sites, and superstructure and infrastructure services, which provides optimal city management based on unified digital databases for all parts of the city, provided that the same spatial databases are used among all members of the electronic network in the city of Aqaba. This contributes to providing optimal and homogeneous management in sustainable management. The process of collecting data on all the components of natural and human tourist attractions is based on the use of Remote Sensing technologies, digital cameras, and RFID technologies, which together constitute the means of data collection in a simultaneous and consecutive manner, easy to process and deal with digitally, as shown in Figure (2).

There are many types of wired networks used in tourist smart cities due to their versatility and overlap. Among the most important of these networks: The Optical Fiber network, which is characterized by a huge data transmission capacity and high speed, and this type of network is used in many British cities such as Liverpool. Another network is the Digital Subscriber Line, which is based on telephone lines. Wireless Fidelity Wi-Fi networks use radio waves to exchange information and are characterized by speed and accuracy. Examples of cities that use this type of network are the cities of Singapore. while the network (Worldwide Interoperability for Microwave Access) is distinguished through providing a wide service of applications such as services represented by remote monitoring systems, linking city buildings, traffic control, sports stadiums, water and gas networks, as shown in Figure (3).

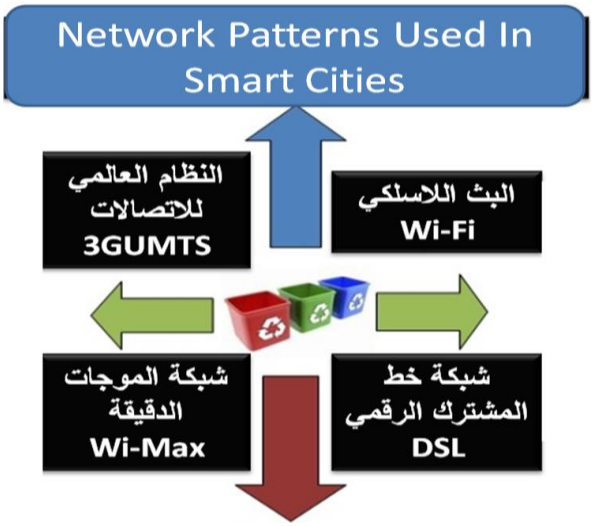

Figure 3. Network pattern used in smart tourist cities (Source: elaborated by the researchers)

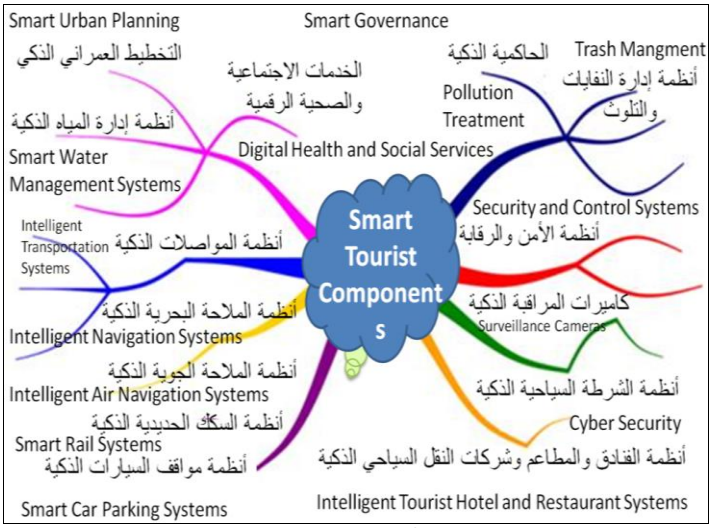

Figure 4. Tourist components of smart tourist cities (Source: elaborated by the researchers)

Cooperation and harmony between all government and private agencies in the city of Aqaba is an important element in the success of the application of the smart city in all sectors, which are recreational, marine, medical, environmental, and educational tourism, in addition to the support services represented in the communications, water and electricity sectors. The targeted sectors, which are clear in Figure (4), represent the basic elements of smart cities, and transforming Aqaba into a smart city is not difficult; because Aqaba is a modern city with a high-level institutional system. The application of digital models contributes to transforming Aqaba into a smart city in reducing the time and place factor as a determinant of activities. In addition to the provision of quantitative and qualitative information will contribute to leading the performance and activity of many tourism investment projects, as shown in Figure (4) and (5). The most important advantage of smart tourism cities is to enable and implement operational services to provide services to local communities and to tourists coming to visit the region. This is done by working to create a digital environment that attracts tourism investments and maintains the sustainability of sustainable economic growth, which contributes to building an urban tourism environment that supports innovation and provides a safe environment while ensuring the integration of local communities, and the participation of citizens in accepting the concept of the smart city. The city of Aqaba is witnessing successive and rapid growth in all aspects of tourism and economics, which requires the authorities in charge of the city's administration to expand investments in the field of information technology; to stimulate economic growth, promote social progress, and improve infrastructure and superstructure conditions. Therefore, transforming Aqaba into a smart city is no longer considered a luxury as much as it is a basic development requirement. Therefore, all policies must be directed towards investments based on digital technology. From here, the work focusing on all investment projects in the city should be based on digital technology, especially in the field of energy, water, and transportation systems. The success of transforming the city of Aqaba into a smart city depends on convincing decision-makers of the importance of adopting the concept of the smart city, as a practical solution to many of the problems facing traditional cities at the present time. The strategy of local authorities in the Aqaba Special Economic Zone, to shift towards a smart city, can be based on a number of axes, including:

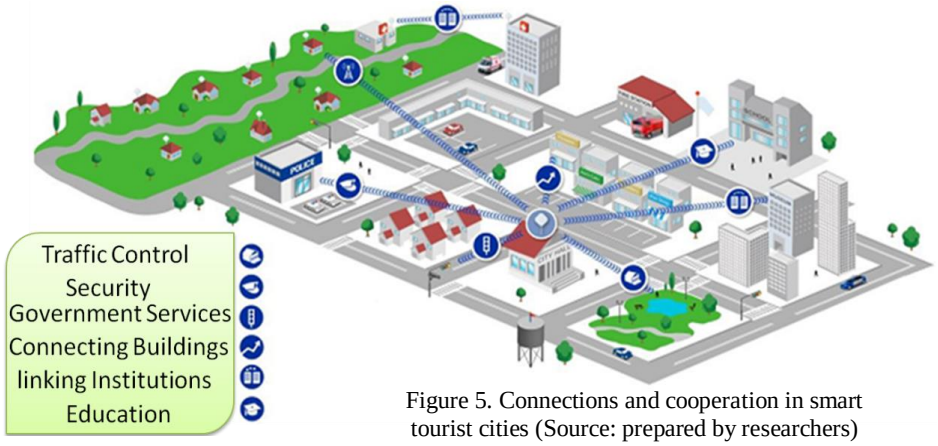

Figure 5. Connections and cooperation in smart tourist cities (Source: prepared by researchers)

1. All smart city standards for local authorities' procurement of services must be based on digital foundations, especially those related to infrastructure and superstructure services.
2. Encouraging all development opportunities by including smart infrastructure, including legislation and laws regulating real estate, tourism, commercial and industrial investments.
3. Commitment to support pioneering programs related to digital technology in all aspects of the tourism industry.
4. Empowering tourism, social, economic, and industrial institutions and supporting them for digital transformation

The world is currently moving strongly towards the digital economy, and the application of the concepts of smart tourism cities, in an accelerating manner. Therefore, we now need smart leaders who are able to lead the future stage. Therefore, the transition to smart sustainable tourism cities requires leaders who are able to lead the future stage, and have an intellectual entrepreneurial; because this transition has become an inevitable necessity, and one of the most important requirements for attracting investments. The integrated management of smart tourist cities is based on scientific foundations. The application of the concepts of integrated management in the city of Aqaba must revolve around the ability to respond with all the data of the current era, which includes providing an optimal digital environment for tourists coming to the city and providing attractive data for tourism investments. So, one of the most important benefits achieved in the integrated management in the city of Aqaba is the ability to access digital information in an easy way. In addition, to build the capacity to locate development problems and the ability to address them and to make decisions by providing a bank in the form of an integrated database that contributes to improving optimal decision-making. The application of integrated smart management in the city of Aqaba contributes to improving the smart management of water resources, by improving the efficiency of distribution, pollution control, water quality, and simultaneous monitoring of water resources in emergency situations such as floods. It also contributes to the smart distribution of water based on Geographic Information Systems (GIS) and Remote Sensing (RS) technologies, which contributes to providing smart management in controlling water resources, especially in light of a water problem that Aqaba suffers from in particular and Jordan in general. The benefit from integrated management in the city of Aqaba is not limited to water resources, but extends to the energy sector, telecommunications, and other sectors, as shown in Figure (6).

The difficulties of transforming the city of Aqaba into a digital smart city

Aqaba represents a promising Jordanian tourism model due to the acceleration in tourism growth related to the many natural and human factors that attract tourism growth. The concept of a smart city is not without its challenges, for example, the success of the city of Aqaba depends on the local community, businessmen, and tourists, and the extent to

which they participate in activities that save energy and apply new technologies. There are many ways to make residential, commercial, and public spaces sustainable by means of technology. But a high percentage of total energy use is still in the hands and behavior of end-users. The implementation of the smart city concept in the city of Aqaba depends on new standards, infrastructure, and solutions in the field of information and communication technology to ensure that this vision becomes a reality. The time factor is also important, as the city of Aqaba needs a short period of time for digital transformation, which requires the gradual adoption of information and communication technology as an enabling tool to address urban challenges in new ways in the city. This will require the availability of a reliable communication Infrastructure. The main challenges of digital transformation in Aqaba are the absence of a strategy that is based on digital urban planning for infrastructure, and the lack of spatial digital maps of the city's tourism and heritage components through GPS. Given that the smart city experience includes many systems and devices that are connected through different technologies, the amount of data generated by these systems can be very huge. If these systems and devices are not immunized, this can lead to great harm and risks, as unprotected data and user information may facilitate the occurrence of malicious activities and cybercrimes. One of the most important priorities in implementing the smart city concept in the city of Aqaba is ensuring the adoption of a strict security strategy and building a regulatory framework that all companies, government departments, and service providers are committed to.

Figure 6. Integrated management of smart tourist cities (Source: elaborated by researchers)

The most important difficulties in implementing the smart city concept are based on the following:

• The high costs of setting up a smart tourist city; What you need from the infrastructure and superstructure.

• Fear of limiting the smart tourist city to the category of tourists, and to a limited group of society, due to the lack of a sufficient level of computer literacy among the city's community members. For the idea of a smart city to succeed, the local community must be prepared.

• Computer viruses and cookies, and problems of privacy violations (Junk mail and spam).

• The difficulty of building a healthy information society in the city. Many electronic citizens deal with nicknames and a hidden identity, which distorts the real information exchange and dilutes the social presence in the exchanged information.

• Absence of a comprehensive vision and a clear strategy towards digital transformation in the city of Aqaba.

• Lack of interest and awareness of those in charge of planning the city of Aqaba with the idea of the smart city as part of the concept of e-government.

• The dispersion of efforts to reach the smart city in Aqaba between several parties and the conflicting spatial databases related to the components of tourist attractions.

• Failure to convert vision and strategy into achievable goals and projects that can be implemented.

RESULTS AND CONCLUSION

1. The study found the importance of adopting digital models in the city of Aqaba with its multiple applications in providing sustainable management in all tourist and heritage sites, transforming them into competitive digital tourist destinations, and giving them comparative advantages in light of the rapid development at the international level in the growth and development of high-end tourism industry.

2. The study presented a number of digital models used in the management of smart tourist cities with the possibility of using them in the city of Aqaba.

3. It is clear from the study that the term “digital or smart tourist city” is one of the modern terms, which includes a strategy based on two areas in the management of the tourist city, namely, the development of digital city strategies represented by computerization of all areas of services provided to tourists. And the second field is based on enabling local communities to transform from the pattern traditional to digital style

4. The study concluded that the most important requirements for smart applications in the administration of the city of Aqaba are the availability of electronic databases, which are based on geographic information systems and the global signature system.

5. The success of transforming the city of Aqaba into a smart city depends on convincing decision-makers of the importance of adopting the concept of the smart city, as a practical solution to many of the problems facing traditional cities at the present time.

6. The integrated management of smart tourism cities is based on scientific foundations. The application of the concepts of integrated management in the city of Aqaba must revolve around the ability to respond with all the data of the current era, including providing an optimal digital environment for tourists coming to the city and providing attractive data for tourism investments.

7. Aqaba represents a promising Jordanian tourism model. Due to the acceleration in tourism growth due to the many natural and human factors that attract tourism growth.

Recommendations

1. Forming a specialized committee whose mission is to develop a clear strategy with the aim of transforming the city of Aqaba into a smart tourist city.

2. All smart city standards for local authorities' procurement of services must be based on digital foundations, especially those related to infrastructure and superstructure services.

3. Encouraging all development opportunities by including smart infrastructure, including legislation and laws regulating real estate, tourism, commercial and industrial investments.

4. Commitment to support pioneering programs related to digital technology in all aspects of the tourism industry.

5. Empowering tourism, social, economic, and industrial institutions and supporting them for digital transformation.

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