Assessing smart sustainability practices in tourism destinations: Evidence from Egypt

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Abstract

By relying on information and communication technology, smart sustainability is one of the crucial issues imposed by environmental difficulties to minimize the damaging effects of tourism activity on the environment. In order to achieve beneficial environmental and social results through market-driven technological innovation, smart sustainability proposes a conceptual framework of a digitally-driven paradigm of urban development. This research aims to evaluate smart sustainability practices in the Egyptian tourism destination. Data was collected depending on a qualitative method by conducting semi-structured interviews with 20 interviewees in the Arab Republic of Egypt (officials in the Ministry of Tourism and Antiquities, tourism experts, experts in the field of information and communication technology, and engineers). The findings showed that there are cities in Egypt that have features that support their transition to smart sustainability, like Sharm El-Sheikh. The findings also demonstrated that the three dimensions of the Egyptian tourism destination's sustainability procedures are good (environmental, social, and economic). If these practices are optimized, Egypt is said to have the potential to become a smart and sustainable tourism destination. The findings also explained the challenges of smart sustainability in Egypt. The research thus recommended that the Ministry of Tourism and Antiquities should increase funding to support the adoption of smart and sustainable practices in partnership with the private tourism sector.
Keywords: information and communication technology, smart city, smart tourism destination, sustainability.

1. Introduction

With all of globalization's detrimental consequences, a new model of sustainable tourism must be created, in which the evaluation of local cultures and identities, the benefits to the economy and society, the preservation of the environment, and the use of information technologies and renewable technologies take precedence in the planning process of tourism destinations (Junior et al.,2017). As a result of emerging and disruptive technology in the environment we inhabit, especially tourism destinations, the smart idea has been transformed from mobile devices to places which are known as smart cities (Coca-stefaniak, 2019). The concept of a smart city, wherein smartness is included in mobility, living, people, governance, the economy, and the environment, establishes the basis for the concept of a smart tourism destination (Gajdosik, 2019). Information and communication technologies are seen as being crucial to the design of innovative urban environments in

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smart cities which aim to support sustainability and enhance the quality of life for their citizens. (Perles Ribes & Ivars Baidal, 2019). Martin *et al* (2019) developed the concept of smart sustainability as a framework to analyze tensions, contradictions and conflicts within the environment-economy relationship at the urban scale, through the selective integration of both environmental and digital goals into entrepreneurial forms of urban governance. Smart sustainability presents a conceptual framework of a digitally-driven mode of urban development that represents a new form of ecological modernization to deliver positive environmental and social outcomes through market-driven technological innovation (March, 2018).

There are few studies of smart sustainability in the tourism industry; the present study attempts to contribute to the debate on this topic. This research adopts a qualitative approach to explore the applications of smart sustainability in the Egyptian tourism destination. The objectives of this study are to discover the concept of smart tourism destination, smart sustainability, and to determine the different opportunities and challenges of smart sustainability application in this context. The following section introduces the literature review on smart sustainability followed by the methodology and results section. Finally, the discussion, conclusion. The current paper addresses the following questions:

- To what extent smart sustainability practices have been achieved in Egypt?
- What is the importance of smart sustainability practices in the Egyptian tourism destination?
- What barriers are there to integrating smart sustainability in the Egyptian tourism destination?

2. Literature Review
2.1 The concept of smart tourism destination

One of the main difficulties in integrating sustainability initiatives over the past 20 years has been tourism destination management. There are various requirements and difficulties for sustainable growth in cities all over the world. The current urban sustainability challenges encompass a wide range of environmental problems, including local traffic issues, air pollution, continuous growth in the generation of solid waste, high energy consumption, materials linked to climate change, and social problems like racial inequality and escalating social tensions (Bouzguenda, 2019). By creating socially inclusive, environmentally friendly, and commercially smart sustainable cities and smart tourism destinations, these difficulties can be addressed (Yigitcanlar et al., 2019). In order to improve the traveler experience, the tourism industry, and the quality of life for local residents, tourism destinations are working to become smart and sustainable tourist destinations by making effective use of technologies to inform tourists about the destination and specifically the services available (Cuesta-Valio et al., 2020). Smart cities and smart tourism destinations are now the foundation for urban and tourism competitiveness as a result of the digital revolution (Del & Baggio, 2015).

Smart tourism destinations are those that are "innovative, built on an infrastructure of state-of-the-art technology guaranteeing the sustainable development of tourist areas, accessible to everyone, which facilitates the tourist's interaction with and integration into his or her surroundings, increases the quality of the experience at the destination, and improves residents' quality of life" (Muthuraman & Al Haziazi, 2019, p. 337). The guiding principles of a smart tourism destination are to provide a more intelligent platform for information gathering and dissemination within the destination, integrate tourism suppliers at both the micro and macro levels in order to ensure that the benefits of the industry are fairly distributed to the local society, improve resource management to increase destination competitiveness, and implement sustainability measures (Buhalis & Amaranggana, 2014).

2.2 Smart sustainability

Information and communication technology developments have fundamentally changed all industries and sectors (Gavrilovi & Maksimovi, 2018). Smart technologies and information management infrastructure are used to express the concept of smart urban tourism. These technologies help by offering more efficient administration of tourism activities in urban areas, which maximizes resource use. As a result, there may be financial and environmental cost benefits representing in (smart and cheaper energy, smart transportation, and less environmental pollution), as well as a reduction in the city's overpopulation issues for both residents and tourists (Gelbman, 2020).
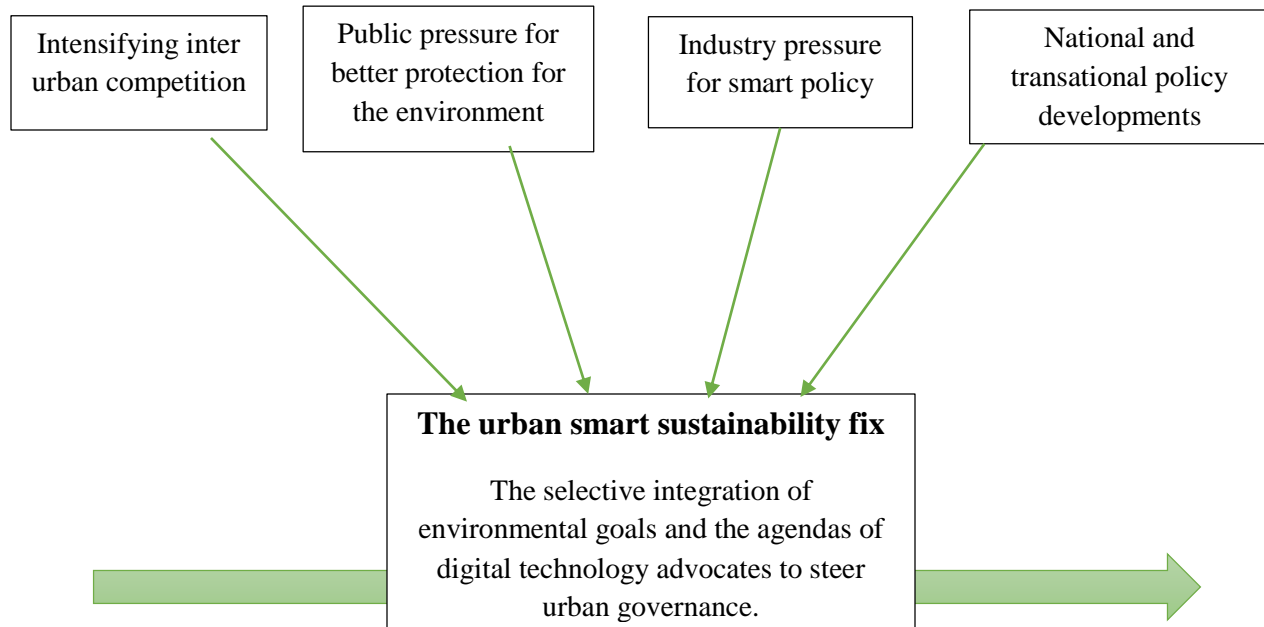
2.2.1 The concept of sustainability

Sustainability, according to the United Nations is "a movement for ensuring a better and more sustainable wellbeing for all, including the future generations, that seeks to address the longstanding global issues of injustice, inequality, peace, climate change, pollution, and environmental degradation" (Ghobakhloo,2020 ,P.2). Sustainability is a multifaceted concept including aspects in the economic, social, and environmental spheres. These factors make up the Triple Bottom Line perspective on sustainability (Braccini & Margherita, 2018).

2.2.2 The development of smart sustainability concept

Infusing sustainability into the activities of any destination and its actors—public and private—is undoubtedly one of the fundamental ideals or concepts (Pawlikowska et al., 2016). The fourth industrial revolution introduced a fresh method for maintaining smart sustainability. The design of smart cities and smart industries is progressively putting a focus on sustainability and resource efficiency. (Roblek et al., 2016). Smart technologies provide new features that transform the way products and services are designed, produced, delivered, and used. Radio-frequency identification tags, digital sensors, networks, and processors create the smart properties related to smart technologies that positively relate to sustainability triple bottom line, and thus offer enormous potential for developing new processes, experiences, organizational forms, and relationships (Saunila et al.,2019).

Through the selective integration of environmental and digital goals into entrepreneurial forms of urban governance, Martin *et al*. (2018) developed the concept of smart sustainability, which draws on smart city literature, as a framework to analyze tensions,

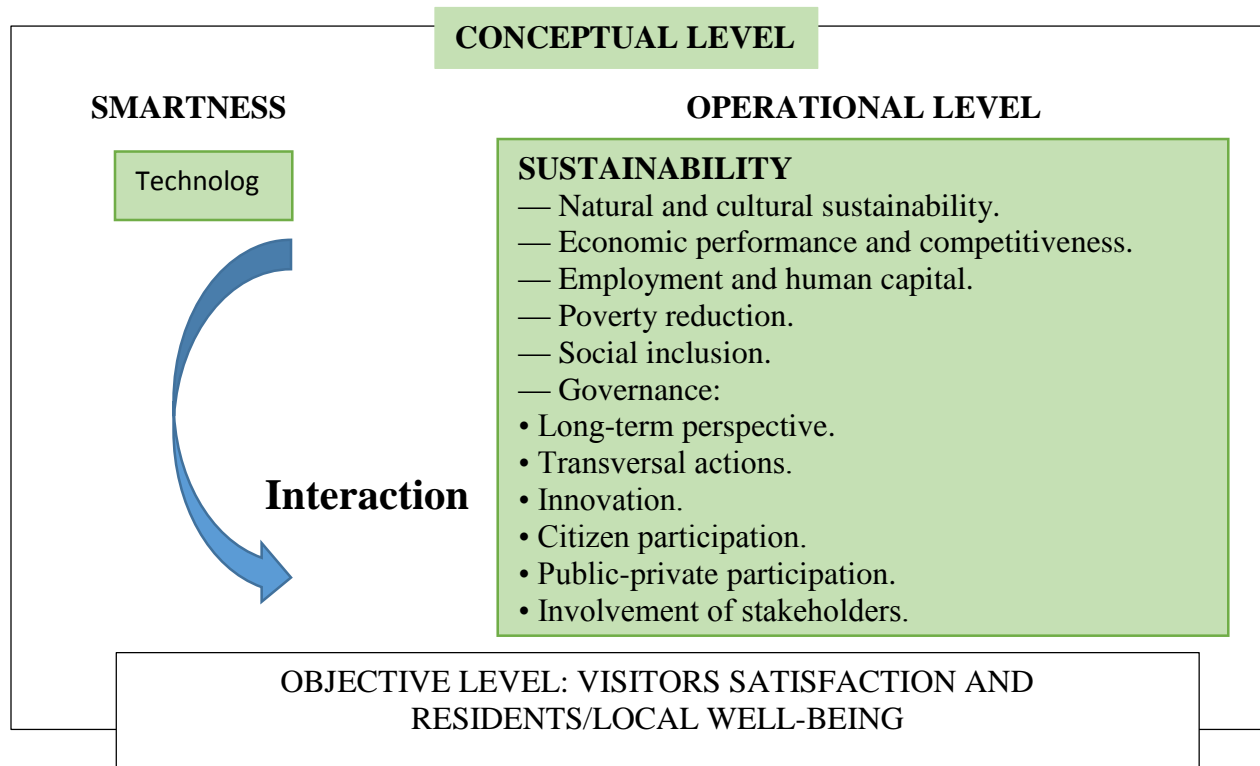───

contradictions, and conflicts within the environment-economy relationship at the urban scale. The following figure illustrates the various components of this concept. A smart city is a place that uses information and communication technologies in a unique and integrated way to support and satisfy the requirements of its residents, businesses, and organizations, particularly in the areas of communication, mobility, the environment, and energy efficiency. The concept of smartness as a driver of sustainability is more illuminating, in our opinion, since it shows a relationship in which smartness is the cause and sustainability is the outcome. Sustainability can be considered a quality of smart destinations (Vargas-Sanchez et al., 2019).

Figure 1. The components of the urban smart-sustainability fix.

Source: (Martin et al., 2018).

There are many similarities between the ideas of sustainability and smartness. A destination cannot be smart from a conceptual standpoint if it is not sustainable. **Figure 3** uses the set that represents sustainability as part of the wider set known as smartness to illustrate this point. The governance pillar of sustainability's set of pillars highlights the portion of characteristics that are shared with the idea of a smart tourism destination. Operationally, a new governance framework dominated by long-term planning, the cross-cutting nature of the necessary actions that extend beyond the institutions or departments related to tourism, innovation and citizen participation, public-private collaboration, and the involvement of all stakeholders are traditional elements in the sense that they have been shared by both concepts, as well as other desirable approaches, such as the achievement of competitiveness (Ribes & Baidal, 2018).

CONCEPTUAL LEVEL

SMARTNESS

OPERATIONAL LEVEL

Technolog

SUSTAINABILITY
— Natural and cultural sustainability.
— Economic performance and competitiveness.
— Employment and human capital.
— Poverty reduction.
— Social inclusion.
— Governance:
• Long-term perspective.
• Transversal actions.
• Innovation.
• Citizen participation.
• Public-private participation.
• Involvement of stakeholders.

Interaction

OBJECTIVE LEVEL: VISITORS SATISFACTION AND
RESIDENTS/LOCAL WELL-BEING

Figure 2. Elements between sustainability and Smartness.
(Ribes & Baidal, 2018).

Smartness and contemporary technologies would be meaningless if they had no effect on the multi-attribute sustainability dimensions. Both practitioners and policymakers are paying increasing attention to intelligence and sustainability. Assessments of smartness and sustainability are essential for steering the decision-making process in a systemic perspective toward sustainability and smart growth goals (Andria et al., 2019). The following table illustrates the relationship between smartness and sustainability and how smartness work as driver of sustainability (Vargas-Sanchez et al., 2019).

Tab. 1: Smartness as a Driver of Sustainability in Tourism Destinations

Smartness	⟶	Sustainability
Dimensions	Level of interaction	Dimensions
Hard: Use of digital advanced technologies (such as Big Data or Internet of Things). -**Soft**: Governance based on a data-driven logic and innovation capabilities.	-**Strategic-Relational**: strategy, planning, innovation management. -**Instrumental**: connectivity of tourist agents and visitors, sensors, information system. -**Applied**: applications and solutions.	-**Economic**: cost savings, reputation, effects on local economy, quality of jobs, etc. -**Social**: preservation of local heritage, way of living and culture in general; mitigating inconvenient caused by over tourism, etc. -**Environmental**: efficiency in water/energy consumption, reduction of greenhouse gases emissions, minimizing congestion problems (growth), etc.

Source: (Vargas-Sanchez et al., 2019).

3. Methodology

This study is exploratory in nature, an inductive study is the most suited approach. Because it may provide a comprehensive understanding of the participant's experience, perspectives, and information about smart sustainability practices in the Egyptian tourism destination, we picked the qualitative method based on the use of interviews. The qualitative approach worked as an appropriate method for collecting a significant amount of data on the research topic and for responding to the research questions (Mohamed and Al-Azab, 2021). When exploring, describing, or explaining anything is the main objective, qualitative research is typically appropriate (Leavy, 2017). Interviews with officials from the Ministry of Tourism and Antiquities, experts in information technology, civil engineers and tourism experts have been undertaken to achieve a comprehensive understanding of the research topic. The grounded theory approach is a technique for identifying theories, hypotheses, concepts, and assumptions directly from facts rather than using a priori assumptions, existing theoretical frameworks, or other research (Taylor et al., 2016). Also, the multinational character of the research technique and the importance of the study issue for the tourism industry inspired the researcher to choose the grounded theory approach, which allowed the researchers to explore and identify novel ideas that had not been anticipated or planned (Charmaz, 2011).

3.1 Data Collection

Data was collected in the qualitative method by conducting semi-structured interviews either face-to-face, through phone calls or through online (Zoom Cloud Meetings) with 20

interviewees in the Arab Republic of Egypt between October and December 2022 until data saturation was achieved. In grounded theory research, the sample size may be determined by the "saturation" process, which is the point at which more interviews stop revealing fresh insights, themes, or theoretical categories. In this scenario, the sampling process is closely related to the analysis process. In quantitative studies, a sample size of 20 would be considered poor, but for a qualitative sample, where some studies used between one and four interviews, it would be regarded as very high (Mohamed and Al-Azab, 2021). Purposive sampling was used and the majority of interviewees held multiple positions in tourism sector and official positions (see Table 2). When a researcher wants to build a historical reality, illustrate a phenomenon, or create something that is rarely discussed, Purposive sampling is important. The researcher's assessment of who can provide the most knowledge to support the study's objectives is the main factor in purposive sampling (kumar, 2014).

Table 2: Interviewees' profile

ID	Institution	Current Profession
E1	Ministry of Tourism and Antiquities	Advisor to the Minister of Tourism and Antiquities for green tourism affairs.
E2	University	Professor of tourism studies.
E3	University	Professor of tourism studies and researcher specialized in smart tourism destinations
E4	University	Professor of tourism studies
E5	University	Professor of tourism studies
E6	University	Professor of tourism studies
E7	University	Professor of tourism studies
E8	University	Professor of tourism studies
E9	University	Professor of tourism studies
E10	Private sector	Architecture and urban planner expert
E11	Private sector	Architecture and urban planner expert
E12	Private sector	Architecture
E13	Private sector	Civil engineer
E14	Private sector	Civil engineer
E15	Private sector	Civil engineer
E16	University	Staff member at faculty of artificial intelligence
E17	University	Staff member at faculty of artificial intelligence
E18	University	Staff member at faculty of artificial intelligence
E19	University	Staff member at faculty of artificial intelligence
E20	University	Staff member at faculty of artificial intelligence

3.2. Data Analysis

Inductive qualitative analysis, which included a procedure of data definition, coding, and data reduction combined under connected order themes, was used to analyze the interview data. Information about interview recording and transcribing is covered at the transcription step. All interviews were conducted, recorded, and verbatim transcriptions (Figure 3) at the conclusion of each interview were done in order to ensure comparability, reliability, and consistency (Mohamed and Al-Azab, 2021). To analyze the data, axial and open coding were used. The properties and dimensions of the concepts in the dataset were described using open coding. The best category and topic were found using axial coding, which was also utilized to relate concepts and categories to one another. Specific codes were produced during and after data analysis, while others were cancelled. Some data pieces were recorded, while others were thought to be more suitable for a different theme than the one to which they had been initially allocated. Finally, verbatim quotes from the interviewees are then provided with an analytical interpretation. (Junior, 2018).
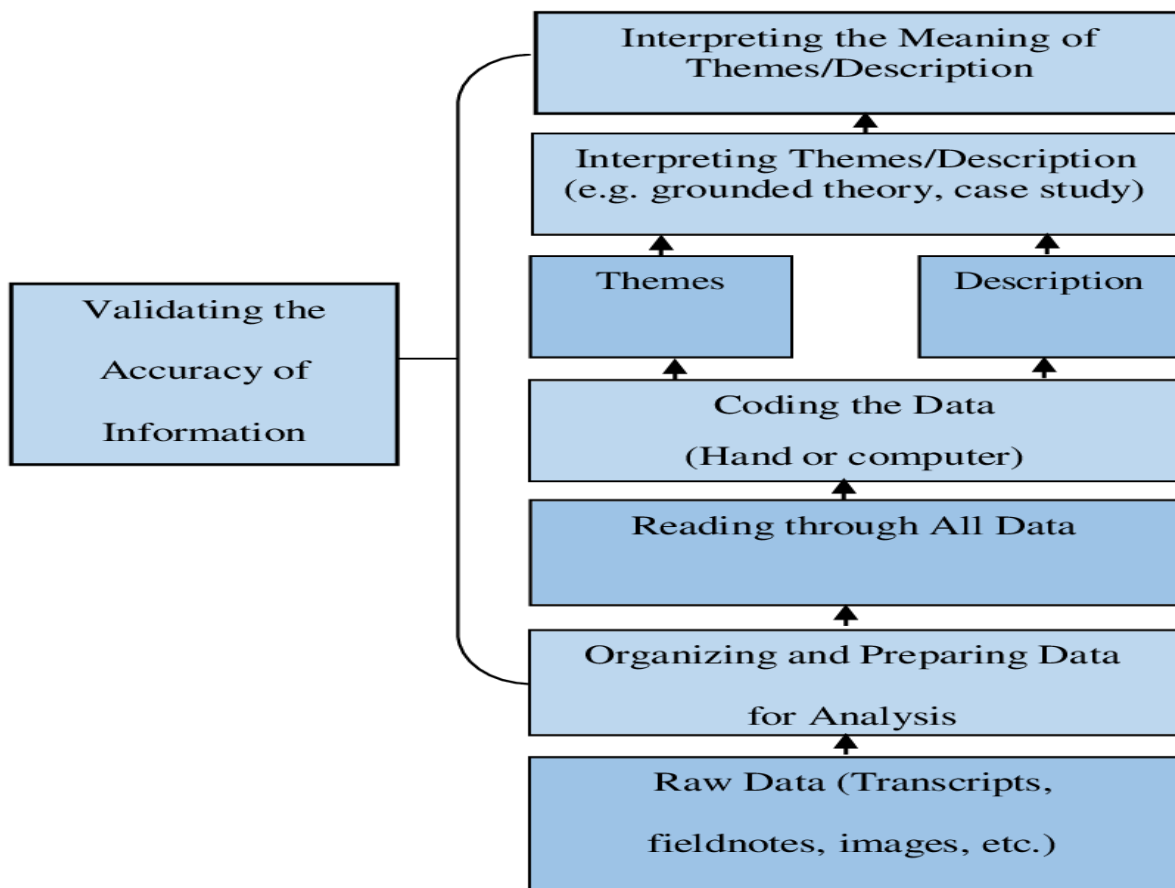
Fig.3. Data analysis in qualitative research
Source: (Mohamed and Al-Azab, 2021).

3.3. Validity, reliability, and transparency

To enhance the credibility, validity, and reliability of the category, the themes, and the sub-themes obtained, Coding was done independently to improve the themes, and the sub-themes' validity, credibility, and reliability. To examine and test the inter-rater agreement, two academics and tourism specialists who weren't involved in the interviews were called. Until the data is available for analysis, these individuals were given a sample of the data and asked to create themes and sub-themes. The majority of the transparency criteria were applied in the study. The level of detail in transcription, the methodological design, saturation degree, use of purposive sampling, data coding by several coders, and inter-rater reliability were all considered.

4. Findings

As shown in Table (2), Personal interviews were conducted with a number of officials in the Ministry of Tourism and Antiquities, tourism experts, experts in the field of information and communication technology, and engineers.

4.1 Elements needed to move toward smart sustainability

Interviewees were asked about the necessary elements for the transition towards smart sustainability and the availability of these elements in the Egyptian tourism destination: Does Egypt have the elements need to move towards smart sustainability? And what are these elements?

Egypt could be a growing country and its cities are tormented by many environmental, social, and economic problems. The Egyptian government faces these obstacles to achieve sustainability and improve the standard of life for citizens within the country's vision for the long run cities. Communication technologies and the fourth cyber-physical revolution served as the motivation for Egyptian stakeholders to focus on the sustainable smart city conception for succeeding generation of Egyptian cities (Abou El Seoud, 2019). The development of tourism industry has been considerably inspired via technological advancements. The "Smart" concept, which has these days won a variety of traction, become created because of the speedy growth of IT and communication technology (Boes et al., 2016). The respondents see that Egypt has a lot of factors that support its transition to smart sustainability.

Cities within the Egyptian tourist destination have a different nature in terms of tourism components, infrastructure components, communication networks, the Internet, and other components necessary to transform the tourism destination into a smart tourist destination. Therefore, it is difficult to talk about converting a tourism destination as a whole, into a smart tourist destination, but we can talk about the cities that have already been worked on converting them into a smart tourist destination inside Egypt, which is the city of Sharm El-Sheikh, in preparation for hosting the COP 27 climate summit.   (E1).

Sharm El-Sheikh has numerous factors that enable it to move toward smart sustainability, including infrastructure and high-speed internet, which is now mandated in all hotels there but is absent from many other Egyptian tourism destinations. Furthermore, in response to the Minister of Tourism and Antiquities' decision No. 18 of 2022 requiring all hotels and tourist establishments to obtain environmentally friendly green certificates, the majority of them, if not all of them, in the city of Sharm El-Sheikh obtained green certificates. This decision has already been implemented for all facilities in the city of Sharm El-Sheikh. (E1).

Smart Destinations are distinct examples of smart cities that implement smart city concepts in urban or rural settings and seek to advance mobility, resource availability and allocation, sustainability, and quality of life for both locals and visitors (Martini et al., 2017).

The global community is now focused on the problem of sustainability. In order to achieve greater sustainability across all sectors, there is also a political tendency around the need to provide new development visions to address concerns of sustainable smart cities in general and new cities in particular. The urban environment of cities as a whole is undergoing continual change in its urban and economic structure due to rising standard of living, advancements in technology, and rapid urbanization. The standard of living in cities is generally improved through sustainable development. This covers the environmental, cultural, social, economic, and political components in addition to the urban component, as well as the infrastructure.   (E12).

There are cities in Egypt that have features that support their transition to smart sustainability, like Sharm El-Sheikh, which has an infrastructure of road networks and transportation networks that includes environmentally friendly means of transportation, public transportation, bicycles, and foot paths, as well as car fuel alternative solutions that reduce traffic congestion and provide logistics information. Along with numerous green, environmentally friendly hotels and high-speed internet. Sharm El-Sheikh thus stands out from other cities in the Egyptian tourist destination due to its many components that contribute to smart sustainability.   (E2).

From sustainability evaluation, many cities are transitioning to smart cities in the twenty-first century. The primary goal of smart cities is to achieve sustainability by utilizing technology advancements and applications (Elfiky, 2019). Egypt has begun to take many steps in building many smart and sustainable cities, which are the basic ingredients for achieving smart sustainability.

Egypt has already begun to construct many new cities, such as the new administrative capital, the city of El Alamein, Sharm El-Sheikh, Aswan, and others, in accordance with the standards of smart and green cities in terms of green buildings, infrastructure equipment, the use of clean energy, the reduction of negative impacts on the environment, and the reliance on information and communication technology to help Achieving sustainability within these cities. Smart sustainability means relying on information and

communication technology in order to preserve economic, social and environmental resources within the tourist destination by relying on artificial intelligence, virtual trips, QR codes, smart LED and video guides, using technology in infrastructure services such as electricity and water, and relying on renewable energy sources. From here, it can be said that Egypt has some cities that possess the elements that help it achieve smart sustainability, but still need more effort in order for all facilities and services to be converted into smart services. (E3, E4).

Smart cities introduce technology and artificial intelligence in a way that is in line with Egypt's sustainable development strategy and Egypt's Vision 2030. Smart cities take advantage of information and communication technology to improve their sustainability, efficiency, and services by integrating operations on several axes, as these cities have a more advanced infrastructure, urban planning of spaces, and technological infrastructure that will allow for high internet speeds. These cities are considered a major step towards achieving smart sustainability within the Egyptian tourist destination. (E14).

The new cities of the fourth generation have been established to help in increasing economic growth, improving the life of the citizen, preventing the growth of crowded regions across the governorates, solving traffic congestion problems, providing nearly 4 million direct job opportunities, and 3 million indirect job opportunities, encouraging investment in the country and revitalizing the real estate market, improving services and preserving the environment and offering the digital technology infrastructure. (E5, E16).

Tourism destination management has been one of the most difficult aspects of implementing sustainability initiatives over the last 20 years. In cities all over the world, there are various requirements and challenges for long-term growth. The current urban sustainability challenges include a wide range of environmental issues, such as local traffic congestion, air pollution, steadily increasing solid waste generation, high energy consumption, materials linked to climate change, and social issues such as discrimination and rising social tensions (Bouzguenda, 2019).

As smart cities are the core of smart sustainability, starting to develop them within Egypt is seen as a key step in this direction. (E7).

With the Sustainable Development Goals, especially Goal No. 11 on Sustainable Cities and Communities, smart cities are becoming increasingly important for achieving several development goals, including the UN Sustainable Development Goals. (E ٩).

The impact of new and disruptive technologies on the spaces we live in, including cities, regions, and countries, has given rise to smart cities. The hospitality and tourism industries have been transformed by technologies of information and communication (Coca-stefaniak, 2019).

Egypt has begun to establish a number of new cities, such as the new administrative capital, the city of El Alamein, and other smart and sustainable cities. These cities become more

compatible with the changes taking place in the global technology environment. As these cities are an advanced model of cities in their network systems, and the activities supporting the knowledge economy from universities, international and private advanced research centers, and their planning and design incorporates the principles of green and smart cities, and competitive economic activities are added to their functions such as global tourism, such as; El Alamein, International trade, centers and services for businessmen, such as East Port Said, and the new administrative capital, which provides a new form of central activities, and attractive business services for international institutions. These components support Egypt's transition to sustainable development. (E18).

The Egyptian tourism destination has the basic elements to move towards smart sustainability such as: availability of information and communication technology infrastructure and ease of access to it throughout the country in general and tourism destinations in particular, The new investment law and its provision of an appropriate investment climate that encourages local and foreign investors to invest in projects that contribute to the transformation towards smart sustainability, especially in tourism destinations and the political leadership Support to m towards smart sustainability in all areas of the country, including tourism. (E10).

4.2 Smart sustainability applications in the Egyptian tourism destination

Interviewees were asked: Has Egypt taken any steps to implement smart sustainability techniques? Give some examples of that?

Information technologies are viewed as critical in the design of innovative environments in smart destinations which aim to support sustainability and improve citizens' quality of life (Gajdosik, 2019).

Egypt is working to build policies for digital transformation and to offer the necessary technological tools, particularly in the newly constructed smart cities. In order to encourage open data projects and expand the range of digital services that rely on that data. (E4, E19).

Technology is quickly moving from being a supplemental tool to being a need. For example, the Internet of Things and sensors offer a wealth of information that city officials can use to track critical incidents as well as current traffic and air pollution levels; additionally, personal smart devices and applications enable citizens to communicate directly with public officials and address issues (Totty, 2017).

The Egyptian government's work program included focusing on economic development and raising the efficiency of government performance through: information technology and communication industries growth, Supporting Egypt's competitiveness by transforming into a digital society and developing the digital economy, Increasing the number of technology centers by 75%, Support for smart city construction, establishing 20

technological villages across the country and establishing the digital city in the administrative capital. (E20).

In the past few years, the Egyptian economy has gone through many stages of development, including the government's National Egyptian initiatives toward the Smart Economy (Hafez, 2020).

Egypt's Vision 2030 in the economic axis included projects in the communications and information technology sector, including: making Egypt a global digital hub by maximizing the use of undersea cables; supporting the Suez Canal development project; taking advantage of the Technology Valley; the national high-speed internet project; and the construction of new cities. (E4, E6).

An essential component of a smart city that depends on citizen engagement and public-private partnerships is smart or e-governance. The objective of becoming a smart destination cannot be realized without good governance of the tourism destination and its stakeholders (Sorokina, 2019).

The Egyptian government aspires to transparency through the effectiveness of government institutions in offering exceptional, high-quality services using technological techniques. The improving and developing communication mechanisms between the government and the citizen program, which aims to strengthen the right to knowledge and make information available and circulate, is one of the initiatives to accomplish this. Another initiative is to "modernize the information infrastructure of the state's administrative structure. (E13).

Smart destinations that heavily incorporate innovation and technology into their operations may improve the management of limited and non-renewable resources. As a result, the sustainability of smart destinations should also include economic and social sustainability in addition to ecological or environmental sustainability (Gretzel et al., 2015).

The Egyptian government seeks to achieve rational and sustainable management of natural resource assets to support the economy, increase competitiveness, create new job opportunities, reduce pollution, and integrate waste management. (E7).

Smart destination is built on the values of innovation and sustainability, working to improve the tourist's experience and enhance the quality of life of local communities (Sanchez, 2016). Sustainability has become the most popular topic on the global stage. This has caused the Egyptian National Strategy 2052 to focus on developing new sustainable urban communities to address these issues, deal with population growth, and raise occupancy to 14% by the year 2052 (Abou El Seoud, 2019).

Egypt has made great steps in order to move towards smart sustainability in many cities and tourism destinations including the shift towards renewable and clean energy, and this is evident in the state's adoption of projects and practices in this regard, including, for

example, the establishment of the Benban solar power plant in Aswan, which serves Aswan, one of the largest Egyptian tourist destinations, in addition to the establishment of the wind farm in Jabal al-Zayt, which is located in the Red Sea Governorate, one of The largest tourist destination, this farm not only produces wind energy, one of the renewable and clean sources of energy, but it also contributes to preserving migratory birds, as it contains radars that sense the movement of birds, and the turbines stop during the crossing of these birds. (E10)

Cities and urban centers, benefit from having safe, clean, sustainable, and egalitarian transportation systems. The goal of smart cities is to combine human capital, infrastructure, and social capital in order to promote more sustainable economic growth and improve the quality of life for city residents (Bamwesigye and Hlavackova, 2019).

Egypt started the transformation towards smart and sustainable transportation in tourist destinations through the expansion of the use of smart electric buses, as well as the expansion of the use of smart participatory bicycles in Sharm El-Sheikh, one of the important tourist destinations in Egypt, in addition to the application of the first smart taxi system in the city. (E10, E15).

Applications that can improve visitor experiences, provide additional value, and boost competitiveness are referred to as smart tourism technologies (Neuhofer et al., 2015). Technology of this kind is the foundational element of information systems that promise to give tourists and service providers more pertinent information, better decision assistance, increased mobility, and, ultimately, more delightful travel experiences (Sigala & Chalkiti 2014).

Egypt started an actions in digital transformation in the services provided to tourists or investors. For example, the Governorate of South Sinai in Sharm El-Sheikh established the first smart city council in Egypt that depends on providing services in a digital way and reducing the human element in providing the service to the lowest possible extent. (E10).

Efficiency in resource use, preservation of environmental purity and physical integrity, conservation of biodiversity, and maintenance of essential ecological processes are all parts of environmental sustainability, which is making the best use of the environmental resources that are crucial to the growth of the tourism industry (Gossling, 2015).

The Egyptian government launched a number of initiatives in order to shift towards smart sustainability, including the signing of a cooperation protocol between the Ministries of Environment and Communications in the field of information and communication technology and the environment. The protocol includes cooperation between the two ministries to implement the green information and communication technology strategy, which includes a number of programs, the program for sustainable management of electronic waste, the program for sustainable management of information and communication technology purchases, as well as the program for raising community awareness of environmentally friendly information and communication technology, and

the program for developing technological infrastructure and raising productive efficiency, in addition to a program to document and modernize the management of natural reserves in Egypt. (E5).

4.3 Smart sustainability challenges

Interviewees were asked: What are the obstacles to apply smart sustainability in the Egyptian tourism destination?

To create a true smart city, a lot of effort needs to be done on the various tasks, implementation issues, multiple operations and regulations, the need for new specific skills, numerous connections to be made, and a great deal of alignment are all present at different levels destination government, public services, transportation services, safety and security, public infrastructure, local government agencies and professionals, educational services (El Assar et al, 2022). Interviewees counted many obstacles that face the Egyptian tourism destination to apply smart sustainability and they agreed on many of them.

The lack of readiness of the infrastructure and communication network, the incompetence of the human element and its inability to deal with modern technology, the lack of funding necessary to implement smart sustainability. (E1, E4, E7).

The prevailing traditional thought in many government agencies, lack of expertise, routine and lack of coordination between government agencies, and finally the funding required for all these services, which require huge funds. (E3).

Despite technical advancements, Egypt's networks, centres, and technology background were not sufficiently developed to enable the country to transform into a smart, sustainable structure. This issue becomes more complicated because each city is unique and needs specific solutions. The biggest obstacle was the nation's inability to provide the technical answer needed to meet these expectations and start the transformation. The nation's actual status in the pertinent sectors and applications is the reason. It is an illustration of the limited technology used in developing countries, such as Egypt (Konbr, 2019).

Weakness of the actual measures taken on the ground for the full implementation of the digital transformation service and the need to conclude more agreements and protocols in the field of technology with international companies (E5).

The lack of understanding of the concept of smart tourist destinations, the absence of funding necessary to achieve smart sustainability, problems related to infrastructure and the Internet, and the absence of coordination and cooperation between ministries. (E12).

Egyptian big cities have environmental and population challenges with limited urban fabric. It needs to develop smart strategies for sustainability to manage issues such as water, energy, urban planning, and green buildings. In many indicators, Egyptian cities go far from both smartness and sustainability, because of current weak initiatives, legislation, and standards (Konbr, 2019).

Expansion operations in smart and sustainable cities face some security concerns related to the absence of a legislative framework that contributes to controlling smart city applications, problems of privacy violations, in addition to lack of funding, poor infrastructure, high costs, and lack of qualified human resources to develop and invest in information and communication technology. (E8).

The cities in Egypt are faced with significant financial constraints, and their capacity to adapt to challenging pressure gradients is constrained. That brings us back to the high development costs and lack of funding needed to support the implementation, together with the lack of an effective e-legislative framework (Konbr, 2019). Interviewee stated that *Funding by the government, because it requires a large investment in technology, in addition to the larger technological gaps between cities and the reality that not all cities can afford such a cost. (E19).*

Another significant obstacle to putting into practice a smart sustainability program is the development of ICT infrastructure, from communication channels to sensors and actuators in physical space. Another major obstacle is a lack of infrastructure (El Assar et al, 2022).

The majority of investors are just interested in making a profit, regardless of the harm that their projects caused to the environment. (E10).

Abu El Ela (2022) summarized the challenges of smart sustainability transformation in many points as: Capacity and coverage technology difficulties, digital security, Law and policies, lack of clarity about advantages, Models of financing and Existence of power, water and transport infrastructure. Interviewees added some points as main challenges:

Weak coordination between the agencies concerned with the application of smart sustainability, as its application overlaps with many entities such as the Ministry of Tourism and Antiquities, the Ministry of Communications, the Ministry of Environment, the Ministry of Electricity and Energy, the Ministry of Transport...etc. (E10).

Investors working on innovative sustainability solutions in tourism destinations are not given any official incentives. (E20).

4.2.4 Importance of smart sustainability in tourism destinations
Today's tourists are more conscious of environmental issues and seek out activities that make better use of the environment. As a result, it is said that tourists' decisions are based on their expectations of the destination's environmental situation (Mihalic, 2013). In this part interviewees were asked: Does the application of smart sustainability practices is beneficial to the tourism destinations?
The adviser of the Minister of Tourism and Antiquities for green tourism affairs said during her interview:
There is no doubt that relying on smart systems and technology in tourism facilities and tourism destinations leads to improving the image of the tourism destination. (E1).

In Sharm El-Sheikh, the Egyptian government has implemented a number of projects to transform the city of Sharm El-Sheikh into a green city, including the deployment of green transportation, fuel stations for cars with natural gas, charging with electricity, the completion of converting all cars to work with natural gas, raising the efficiency of roads and bridges, and increasing green spaces. (E1).

Relying on information and communication technology leads to reducing the negative effects of tourism activity, protecting resources, and relying on renewable energy sources. All this leads to sustainable and environmentally friendly tourism activity in all sectors of tourism activity, which actually improve the destination image. (E5).

Su and Huang (2019) concluded that destinations that practice environmental sustainability, such as reducing the carbon footprint of tourism, implementing responsible environmental standards in tourist attractions, offering certifications for sustainable destinations, etc., offer better tourism experiences, which is reflected in visitor satisfaction. A tourism expert and researcher in smart tourism destinations stated during his interview:

Preserving the environment and protecting the rights of future generations has become a general trend in the world, and the tourist himself is looking for a clean environment. In addition, the success of tourism activity in any country is fully linked to achieving sustainability. Relying on information and communication technology contributes to improving the green image of the tourism destination as a destination that cares about the negative effects on the environment and tries to avoid them, which helps to give the destination a competitive advantage over other traditional destinations. (E3).

5. Conclusion

The study aimed to assess smart sustainability practices in Egypt's tourism destination. The recent emergence of smart cities has raised new expectations for the sustainability of tourism destinations. The current research is an inductive explanation of the importance of smart sustainability practices in the Egyptian tourism destination and the challenges that these practices face. Semi-structured interviews with tourism experts, officials from the Ministry of Tourism and Antiquities, and information technology experts were used in an inductive qualitative analysis for this function. The term "smart sustainability" refers to the use of smart technologies to achieve efficient management of tourism activities in tourism destinations, thereby maximizing resource use and achieving environmental benefits. The findings showed that there are cities in Egypt that have features that support their transition to smart sustainability, like Sharm El-Sheikh. The findings also demonstrated that the Egyptian tourism destination's sustainability procedures are good. If these practices are optimized, Egypt is said to have the potential to become a smart and sustainable tourism destination. The findings also explained the challenges of smart sustainability in Egypt. Based on the findings of the study, the researchers recommend that the Ministry of Tourism and Antiquities should increase funding to support the adoption of smart and sustainable practices in partnership with the private tourism sector and strengthen the development of

Smart Tourism Destinations to increase Egypt's competitiveness as a tourism destination around the world.

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تقييم ممارسات الاستدامة الذكية في المقاصد السياحية: مصر نموذجاً

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الملخص العربي

تعد الاستدامة الذكية واحدة من القضايا الحاسمة التي تفرضها الصعوبات البيئية لتقليل الآثار الضارة للنشاط السياحي على البيئة. من أجل تحقيق نتائج بيئية واجتماعية مفيدة من خلال الابتكار التكنولوجي الذي يحركه السوق ، تقترح الاستدامة الذكية إطارًا مفاهيميًا مدعم بالتكنولوجيا الرقمية لتحقيق التنمية الحضرية المستدامة. تهدف هذه الدراسة إلى تقييم ممارسات الاستدامة الذكية في المقصد السياحي المصري. تم جمع البيانات عن طريق إجراء مقابلات شخصية مع مسؤولون في وزارة السياحة والآثار ، وخبراء في السياحة ، وخبراء في مجال تكنولوجيا المعلومات والاتصالات ، ومهندسون). أظهرت النتائج أن هناك مدنًا في مصر بها ميزات تدعم انتقالها إلى الاستدامة الذكية ، مثل شرم الشيخ. كما أظهرت النتائج أن ممارسات الاستدامة الذكية في المقصد السياحي المصري جيدة. إذا تم تحسين هذه الممارسات يمكن القول أن مصر لديها القدرة على أن تصبح مقصد سياحي ذكي ومستدام. كما أوضحت النتائج التحديات التي تواجه تحقيق ممارسات الاستدامة الذكية في المقصد السياحي المصري.

الكلمات الدالة: تكنولوجيا المعلومات والاتصالات ، المدينة الذكية ، المقصد السياحي الذكي ، الاستدامة.