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Digital Transformation and AI in Tourism: Trends, Challenges, and Successful Experiences

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Abstract :

This research paper aims to examine the tourism industry, an indispensable and productive sector that has undergone a transformative shift primarily propelled by the Fourth Industrial Revolution. The tourism sector has achieved a remarkable milestone by adopting digital transformation, artificial intelligence, and modern technologies, generating new, superior quality tourism products. The underlying objective is to build intelligent cities that endorse sustainable development and meet the expectations of global tourists. For this, this research relied on a descriptive approach by observing and collecting data. This study concluded that several nations have demonstrated impressive progress in digitizing their cities, particularly in the tourism sector, accruing a competitive advantage and a dominant position in the global market. Furthermore, they have simultaneously attracted a significant number of tourists from across the globe, primarily due travel facilities.

Keywords:

Tourism; Digital Transformation; Artificial Intelligence; Information and Communication Technology; Smart City.

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1. INTRODUCTION:

The incorporation of information and communication technologies (ICTs) has become an indispensable requirement across numerous economic sectors, thereby necessitating their implementation to remain abreast of technological advancements. Their critical import is grounded in their ability to curtail time constraints, expedite service delivery, and minimize errors, resulting in their wide-ranging application in predominantly productive and essential sectors, notably in the tourism industry. This industry is deemed to be one of the most economically competent sectors in driving comprehensive development in several countries, attributable to its potential to allure foreign investments and heighten national income. Nonetheless, the country's resources alone are insufficient to enable the development of the tourism sector, and the focus should be on digitalization and automation, especially in the aftermath of the Covid-19 pandemic. Which has accentuated the fact that countries that have embraced digital and smart tourism, harnessing all the necessary infrastructural resources, have achieved substantial economic savings, thereby positively influencing their local economy. Conversely, countries that have yet to embark on digital and smart tourism have suffered significant losses.

1.1. Statement of the Problem: In the contemporary world, smart digital solutions have emerged as the sole recourse for achieving development, bolstering competitiveness, and keeping abreast of transformative forces. Through the provision of a comprehensive travel and traveler database, it becomes feasible to discern the intricate facets of the tourism domain, promptly address unforeseen circumstances, and cater to the diverse requirements of tourists, irrespective of their geographical origins and preferences. Consequently, the imperative arises to engender urban development and imbue cities with smart attributes, thereby fostering intelligent tourism services and destinations that align with the expectations of global travelers, extending beyond the confines of local demand. Such endeavors assume paramount significance as they furnish an environment conducive to sustainable living, efficient management, effective governance, and progressive advancement.

1.2. Research Question: In light of these considerations, a pivotal inquiry arises: “What are the present-day trends and forthcoming challenges encountered by the tourism sector in the context of harnessing digital transformation technologies and integrating artificial intelligence, particularly in countries that have demonstrated successful implementation?”

1.3. Hypothesis: This research works on the following hypothesis. It suggests that the fourth industrial revolution, marked by the widespread use of modern technologies such as digital transformation and artificial intelligence, has impacted the tourism sector of countries implementing it positively , this is by enjoying competitive advantages, including economic savings and continuity of work.

1.4. Significance of the Study: The importance of research in diagnosing and analyzing the role of Artificial Intelligence in enhancing the tourism sector.

1.5. Objectives of the Study: The aim of this article is to provide the most recent literature analysis on digital transformation in tourism via summarizing and outlining the main directions and trends. In order to achieve the set goal, the following tasks are realized in the work:

- Presentation of Artificial Intelligence (AI), Digital Tourism and Smart Tourism.
- Diagnosis of the pioneering experiences and applications of the fourth industrial revolution in tourism
- Examination of the reality of Algeria's experience in the tourism sector in light of the fourth industrial revolution.

1.6. Methodology of the Study: To carry out our study, the descriptive research approach has been used by observing, collecting data, examination of documents and case studies in order to gain a deeper understanding of our topic. The findings from the descriptive research provide valuable insights and inform future research.

1.7. Previous researches: This research work relies on a variety of recent studies and official reports. The analysis of the latest literature (2013-2022) is performed focused on digital transformation in tourism, Artificial Intelligence, Smart City and Smart Tourism, experiences and applications of digital tourism is presented in this research article. In this article, scientific articles from several principle databases - Web of Science, Scopus, ScienceDirect, SpringerLink, - are analysed, as well as information from OECD and World Tourism Organisation. This literature review provides groundwork for future research.

1.8. Organization of the Study: In order to address the problematic scientifically, the study has been divided into three main parts as follows: the first part includes the theoretical aspect of the research (Digital tourism, smart city, Artificial Intelligence). The second part showcases pioneering experiences and applications of the Fourth Industrial Revolution in the tourism sector. Then, the third examines the reality of Algeria's experience in the tourism sector in light of the fourth industrial revolution and some recommendations for promoting electronic tourism in Algeria.

2. Theoretical framework:

2.1 Basics of Tourism, Digital Tourism and Smart Tourism:

An introduction to digital tourism and smart tourism will be provided.

2.1.1The concept of tourism:

The definitions of tourism have varied due to the different researchers and the different criteria for distinguishing between them.

According to the World Tourism Organization WTO (1993) “Tourism encompasses the activities of persons traveling and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes.”

The definition of tourism according to the French Economic and Social Council: In its 1972 resolution, it defines it as "the art of meeting the very diverse desires that drive

out of the daily sphere. According to this definition, tourism is an art that differs from other activities because of its nature and its tools.

According to the Tourism Society of Britain, "tourism is the temporary short-period movement of people to destination outside the places where they normally live, work; and activities during their stay at these destinations." This definition includes the movement of people for all purposes.

2.1.2 Basics of Digital Tourism (Electronic Tourism): The basics of digital tourism will be explored.

2.1.2.1 Overview of Digital Tourism (Electronic Tourism):

Digital tourism or Electronic tourism (E-tourism), as one type of ecommerce, is also an industry, which deals with sales and marketing of products and services through an electronic system. Like the e-commerce, it also includes electronic data transfer, distribution management, e-marketing (online marketing), online transactions, electronic data exchange, management systems and automated data collection. In addition, e-tourism is complemented by the specific activities of tourism such as the emergence of tour operators, travel agencies and other tourism sectors in the virtual space. E-tourism involves e-information, e-booking (hotels, transport, etc.) and electronic payment for the consumers. (Beatrice an&d Mihãlcescu, 2013)

The meaning of digital tourism is linked to the support of tourism experiences through digital tools. (Benyon et al., 2014) Digital tourism means the use of an infocommunication tool, an IT solution that can help to meet the needs of tourists and improves the competitiveness of organizations and businesses in tourism.

Digital tourism entails the incorporation of electronic commerce and internet technologies in the tourism and travel industry to optimize the operations of tourism suppliers and enhance facilities for tourists. It encompasses diverse tourism activities, including online tourism program offers, trip booking and organization, and post-product acquisition services (tourism services).

2.1.2.2. Digital technology applications in the tourism industry:

The progression of digital technology has spurred the rapid development of digital tourism applications. Among these advancements are automated tourism reservation systems, global tourism booking systems, the ubiquitous internet network, electronic customer management solutions, electronic tourism destination websites, virtual reality tourism experiences, and mobile tourism services.

2.1.3 Foundational Aspects of Smart Tourism:

In this section, we will explore the fundamentals of smart tourism.

2.1.3.1 A brief Overview on Smart Tourism:

Smart tourism denotes the unification of three critical components: technology, technology users, and the promotion of tourist destinations. This convergence amplifies the tourist experience and enhances tourism services to align with the aspirations of

tourists, while concurrently reflecting the shared interests between tourism providers and tourists. Smart tourism implementation necessitates the acquisition of tourism information by leveraging internet tools (Kazandzhieva & Santana, 2019, p. 334). The tools employed in smart tourism hinge on artificial intelligence, smartphones, telecommunications, and information technology.

Effective implementation of smart tourism is contingent upon certain prerequisites, including the digitalization of the tourism sector's infrastructure through the creation of comprehensive tourism information databases. Additionally, it necessitates the involvement of governmental entities in directing and regulating the performance and quality of digital services, the existence of digital urban planning strategies that encompass infrastructure components such as road systems, communication networks, and general services. Moreover, supportive legislation and financing are vital to the implementation of smart policies and transition programs towards smart cities. Finally, the availability of adept technical personnel responsible for the digital system's operation and supervision, coupled with the promotion of public awareness regarding its economic significance, are essential considerations.

2.1.3.2.The Smart City concept:

A smart city can be defined as city that utilizes Information and Communication Technologies (ICTs) to enhance quality of life, to perform urban services, to reduce costs and resource consumption and to participate and engage more effectively and actively with its citizens (Nguyen, 2021).

The concept of the Smart City represents a paradigm shift in urban development, wherein advanced information technology is seamlessly integrated into the fabric of city management to improve the quality of life for its inhabitants.

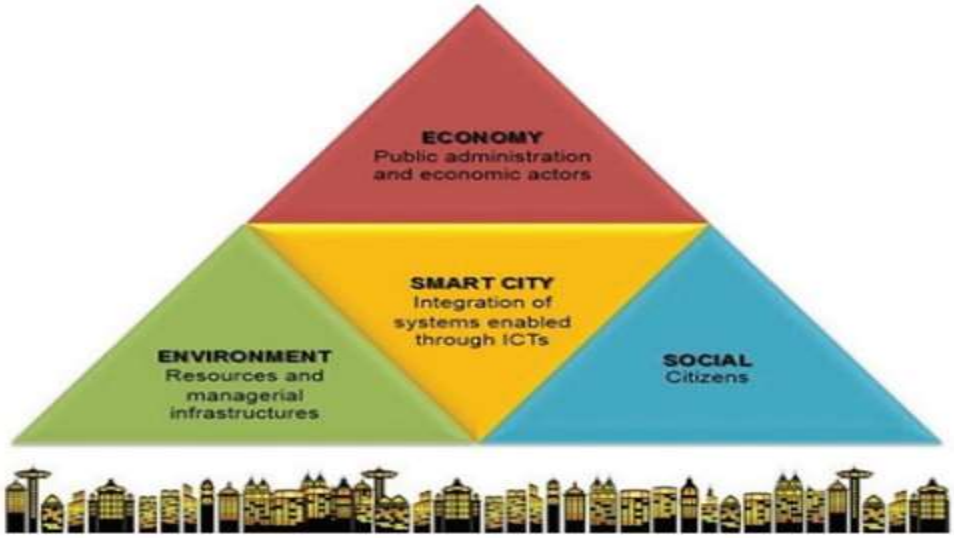
To make a clear vision of the smart city Concept (SMC), Daniel & Doran (2013) developed a smart city model to represent the three main components that include: Economy, Environment and Society (Figure 1) which form an interconnected system aimed at achieving sustainable urban development.

The three pillars smart city model describes the integration of economy (public administration and economic actors), environment (resources and managerial infrastructures and social (citizens). The social component consists of various aspects of society such as community life, urban mediation, participatory democracy, social innovation, human scale cities. Smart city planning is modeled on these three pillars to create an innovative, prosperous, civic and sustainable smart city. There are smart city projects across the globe, over 2,000 projects have been started and are going on in Asia, Europe, America and Africa (Tiwari & Jane, 2013).

The overarching goals of Smart City initiatives are diverse and interconnected. They encompass environmental stewardship, economic prosperity, social equity, and quality of life improvement. By reducing carbon emissions and optimizing energy consumption, Smart Cities contribute to the global effort to combat climate change and create more sustainable urban environments. Simultaneously, they foster economic growth by

attracting specialized industries and promoting innovation and entrepreneurship. Moreover, the emphasis on social inclusivity and community engagement cultivates cohesive and harmonious societies, where diverse groups of residents have equal access to opportunities and resources.

Figure N°01: Three pillars Smart City Model



Source: Daniel &Doran, 2013, p.46.

2.2 Information and Communication Technology and Digital Transformation:

Access of information is the key factor for making democracy successful. Due to the invention of Information and Communication Technology (ICT), the new global information had been mobilizing the institutional transformation in the sphere of mechanical and organic structure of society.

2.2.1 Definition of Information and Communication Technology (ICT):

ICT stands for Information and Communication Technologies. It refers to several sets of technological tools that can help to provide right to information and equal services to the people by minimal cost, time and effort.

According to Mohamed Taher "ICT (Information and Communications Technology – or Technologies) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning" (Dwivedi et all, 2005,p37).

ESCAP (2001) defined ICT as technological tools that people use to share, distribute, gather information, and to communicate with one another, one by one, or in groups, through the use of computers and computer networks which had been interconnected (Bhattacharya, 2013).

The emergence of ICT has opened up new avenues for jobs by business process outsourcing or web enabled services. All credit to the internet, now developing countries

also participate in the process of global economy.

2.2.2. The Fundamentals of the Digital Divide

The digital divide encompasses the prevalent gap in most nations between individuals who possess the capacity to effectively use information and communication technology (ICT) tools and have knowledge of accessing them, and those who lack access or proficiency in this domain. Moreover, there exists an additional gap between developed and underdeveloped nations concerning global access to technology. The multi-dimensional digital divide model is predicated on a sequence of phases, starting with the gap in access, followed by the gap in usage, then the one in skills, and culminating with the gap in direction (Alyan & Aaber, 2017, p. 12).

2.2.3 The Digital Transformation:

In the context of our exploration of the intersection between digital transformation and tourism through heritage, it is essential to grasp the essence of digital transformation and its wide-ranging ramifications.

2.2.3.1 What is Digital Transformation?

Digital transformation is a universal phenomenon where businesses use digital technologies to change, improve, enhance, and replace existing business processes. Some transformations have been ongoing for decades, while others are still in nascent stages.

Digital transformations are often largely focused on improving the customer experience, leveraging digital technologies to change how customers interact with businesses and their products, and improving how businesses serve their clients. The transition from analog to digital data storage and transactions is included, as are iterative and revolutionary transformations beyond the initial transition.

To be clear, digital transformation is not just making minor incremental improvements as new technologies become available but radically changing how things get done facilitated by new methodologies and the digital technologies making this possible.

2.2.3.2The Four Pillars of Digital Transformation:

There are four pillars of digital transformation that we see today: IT uplift, digitizing operations, digital marketing, and digital businesses. All four are part of most companies' digital transformation journey. Below the four pillars are outlined (Mai,2022):

- **IT uplift:** For many companies, digital transformation starts with upgrading the company's IT infrastructure as well as mobile infrastructure, data lakes, and the cloud. Essentially, this is an opportunity to use the budget allocated to "digital initiatives" to modernize IT and communications platforms within the business enterprise.
- **Digitizing operations:** A second critical pillar of digital transformation, often tackled earlier in the digital transformation journey, is using digital for optimizing, simplifying, and rationalizing existing processes. The goal here is to use digital

tools, including more advanced technologies such as AI, 5G, and IOT, to streamline business growth.

- **Digital marketing:** This pillar is different from the others in its focus on digital tools to interact and sell to customers. Not surprisingly, it requires different resources, such as investing in capturing clean data, digital tools including artificial intelligence to understand customers, and omnichannel presence.
- **New ventures:** Digital technology has opened up a world of new opportunities for established companies. Seizing these opportunities requires both the development of innovation and digital capabilities, as well as the ability to pivot to new sources of growth.

2.2.4 Digitization of cultural heritage:

The concept of heritage comprises the intellectual, scientific, and literary legacies that are inherited and bequeathed by a nation. These legacies reflect the cultural identity of the nation and shape its present and future. The advent of information and communication technology has facilitated the process of heritage digitization, which involves transferring works that have entered the public domain from the physical shelves of libraries to digital platforms, such as CDs, portable storage media, computers, and the Internet. These platforms offer vast storage capacities, easy accessibility, and infinite possibilities for reproduction (Zerbi & Mikolajewska, 2022, p.32).

Digitization represents a potent means of preserving rare and valuable heritage materials while obviating the need to rely solely on original sources. Instead, it provides alternative electronic copies that are easily available to a broad audience within an expansive electronic access network. Digitization enhances the reading experience of heritage materials by offering a range of features, including text zooming, comparison, dimension tracking, and high-speed link systems for efficient navigation to specific parts or details of the text. The application of digitization to cultural heritage gives rise to digital cultural content, which can be classified into four axes: digital content of tangible cultural heritage, digital content of intangible cultural heritage, digital content of visual art, and digital content of intellectual and literary heritage (Zerbi & Mikolajewska, 2022, p.32).

The preservation and protection of cultural heritage through digitization methods relies heavily on the effective use of technological tools and methods. It is imperative that the heritage remains unaltered even after intervention for restoration, repair, or any other necessary process. As we embark on the digital transformation journey to serve the cultural heritage, it is critical to exercise control over the means that lead to a comprehensive integration of the heritage. This integration involves utilizing cutting-edge equipment such as scanning devices, digital cameras, computers and their accessories, image capture software, image editing programs, optical character recognition software, and digital asset management programs (Ayda & Harkas, 2023, p. 9).

2.3 The concept of the Fourth Industrial Revolution:

The 21st-century industrial revolution is digital. Industry 4.0, the Fourth Industrial Revolution, and 4IR all refer to the current era of connectivity, advanced analytics, automation, and advanced-manufacturing technology that has been transforming global business for years. This wave of change in the manufacturing sector began in the mid-2010s and holds significant potential for operations and the future of production.

2.3.1 What is the Fourth Industrial Revolution?

Industry 4.0—also called the Fourth Industrial Revolution or 4IR—is the next phase in the digitization of the manufacturing sector, driven by disruptive trends including the rise of data and connectivity, analytics, human-machine interaction, and improvements in robotics.

4IR, or Industry 4.0, conceptualises rapid change to technology, industries, and societal patterns and processes in the 21st century due to increasing interconnectivity and smart automation. The term was popularised in 2015 by Klaus Schwab, the World Economic Forum founder and executive chairman, and has since been used in numerous economic, political, and scientific articles in reference to the current era of emerging high technology (McKinsey & Company, 2022).

The Fourth Industrial Revolution (4IR) has been defined as technological developments in cyber-physical systems such as high capacity connectivity; new human-machine interaction modes such as touch interfaces and virtual reality systems; and improvements in transferring digital instructions to the physical world including robotics and 3D printing (additive manufacturing); the Internet of Things (IoT); "big data" and cloud computing and artificial intelligence-based systems.

2.3.2 How Did The Fourth Industrial Revolution Arise?

To analyse how we have reached the Fourth Industrial Revolution it is a good idea to look back at the previous three industrial revolutions (Schwab, 2023):

- **First Industrial Revolution.** It occurred at the end of the 18th century, in 1784 and it was marked by a transition from hand production methods to machines through the use of steam power and water power. The invention of the first mechanised loom was a watershed.
- **Second Industrial Revolution.** Also known as the Technological Revolution, is the period between 1871 and 1914 that resulted from installations of extensive railroad and telegraph networks, which allowed for faster transfer of people and ideas, as well as electricity. Increasing electrification allowed for factories to develop the modern production line. It was a period of great economic growth, with an increase in productivity, which also caused a surge in unemployment since many factory workers were replaced by machines
- **Third Industrial Revolution.** The Third Industrial Revolution, also known as the Digital Revolution, occurred in the late 20th century, after the end of the two world wars, resulting from a slowdown of industrialisation and technological

advancement compared to previous periods. The production of the Z1 computer, which used binary floating-point numbers and Boolean logic, a decade later, was the beginning of more advanced digital developments. The next significant development in communication technologies was the supercomputer, with extensive use of computer and communication technologies in the production process; machinery began to abrogate the need for human power

Around 2014, the industry experienced another "about turn" with the appearance of smart factories and online production management. Returning to Schwab and his book *The Fourth Industrial Revolution,* the German economist foresaw what was to come: "We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another". In its scale, scope and complexity, what I consider to be the Fourth Industrial Revolution is unlike anything humankind has experienced before. And this is for three reasons about which the experts agree: Its speed, scope and unprecedented impact.

3. How Artificial Intelligence (AI) is Transforming the Travel Industry?

Artificial intelligence is a hot topic in travel industry. It is considered as the next frontier of tourism sector. Artificial Intelligence is a broad term which has covered a wide range of different technologies.

3.1 Artificial Intelligence (AI): An overview

3.1.1 The concept of Artificial Intelligence:

Artificial Intelligence is an increasingly popular term that lacks a unified, concrete definition.

According to Russell and Norvig (2016) AI is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. Technically speaking, Artificial intelligence is an integration process in between cloud computing, network devices, robots, computer, and digital content production and in various business processes, systems, and daily life operations.

The concept of Artificial Intelligence refers to technology that is seeking to mimic human intelligence. Artificial Intelligence includes a broad variety of capabilities such as voice, image recognition, machine learning and semantic searching (Gentsh, 2019). It is used to simulate human intelligence in machines, saving a lot of time and money in doing business.

Historically, four different approaches have been explored to Ai are: Think humanly, Think rationally, Act humanely, Act rationally.

Whereas AI marketing is considered as a method of leveraging intelligence technologies to collect data, customer insights, anticipate customers' next moves, and make automated decisions that impact marketing efforts. In marketing, AI is usually used in which speed is essential. AI, actually, can boost the return of investment (ROI) of marketing. With AI, marketers can understand their customers' behaviors deeply, know

their actions and indications. Therefore, they can target the right strategy to the right person in a time-saving and effective way (American Marketing Association).

3.1.2 Technologies and Indicators of Artificial Intelligence:

Artificial intelligence (AI) uses a range of technologies to simulate intelligent behavior in systems. These technologies often draw inspiration from the field of biology, incorporating algorithms and neural networks. Algorithms, which are sets of rules and instructions, allow AI systems to process data and make decisions based on patterns and calculations. Neural networks, on the other hand, are designed to mimic the structure and function of the human brain, enabling AI systems to learn from experience and improve their performance over time. Its indicators are centered on the preparedness of the network, the progression of information and communication technology, and the maturation of electronic governance.

3.2 The role of Artificial Intelligence in enhancing tourism

Travel and tourism industry is growing rapidly as cities restore normalcy after the pandemic. With an increasing number of travelers, hospitality industry is relying on technology to serve customers, more than ever. As a result, different technologies are being used to simplify and streamline operations and raise customer satisfaction.

The advantages of Artificial Intelligence (AI) in the travel industry are enormous and far-reaching. It is transforming the way people travel. In fact, according to an IndustryArc report, the travel AI market is expected to exceed $1.2 billion by 2026. (Negreanu, 2023)

3.2.1 AI Artificial Intelligence: Revolutionizes Baggage Handling at Airports:

The transportation of luggage from the airport terminal to the aircraft manually is a laborious process that demands considerable time and resources. However, the integration of automated processes, such as check-in, baggage screening, sorting, and handling, has been shown to offer a number of benefits, including improved efficiency, enhanced passenger experience, and enhanced safety.

In particular, the automated baggage handling and sorting systems implemented in airports provide a highly effective platform for the coordination of time-critical and complex procedures associated with air travel. As a result, the automation of such processes not only facilitates operations and streamlines efficiency but also ensures a high degree of accuracy and precision.

In response to customer complaints regarding the delay in the delivery of luggage carts, airports have sought to introduce robotic and automated systems to their baggage handling and delivery operations. By adopting these systems, airports can significantly reduce passenger wait times and simplify operations, resulting in a more streamlined and efficient travel experience.

Although these robotic systems are primarily designed to serve passengers, they also offer significant benefits to airlines and airports. For example, early baggage handling allows airport staff to quickly and efficiently transport luggage to the aircraft,

minimizing the risk of delays or lost items. Furthermore, UV sterilization robots can enhance airport security by providing a thorough and reliable means of cleaning and sanitizing high-touch surfaces. In the quest to improve airport services and mitigate the prolonged waiting times arising from flight delays, aviation specialists are actively harnessing the power of data and artificial intelligence (AI). Specifically, they rely on real-time analytics to prepare airports to proactively alert and direct passengers before their arrival, thereby circumventing the need for them to wait. Additionally, they can leverage AI algorithms to expedite security inspections by simply scanning passports and capturing images to verify passengers' identities directly, avoiding the need to open luggage. These innovative strategies have the potential to significantly enhance the efficiency and effectiveness of airport operations, ultimately resulting in an improved passenger experience.

3.2.2 Emerging Technological Trends Unveiling the Directions of the Travel and Tourism Industry:

No industry in today's time is untouched by technology. Humans want to undertake practices that save time and lessen effort. They also want desired results from these practices. This could only be made possible through technology.

The usage of AI in travel industry has borne fruits so far. Customers feel seen, heard and served better. Let's dive into the ways AI is used in travel and tourism industry:

- **Smart AI-powered travel applications:** AI in travel industry enables a traveler to plan a personalized trip. A smart AI-powered application can help a traveler choose what suits him/her the best. These applications are used by various brands to help customize journey experience for a customer. They also offer travel mapping to provide guidance to travelers and help them explore the places they intend to.
- **Travel chatbots:** AI-driven chatbots is a trending topic in hospitality industry from quite some time now. Booking queries were never handled in a timelier manner ever before. With travel chatbots, answers can be found at one place. Chatbots assist travelers and tourists by providing all the vital information they would require before, during and after their travel journey. This makes the journey convenient and pleasant for travelers.
- **Voice-based assistants:** AI technology has laid foundation for a digitized hospitality industry. Voice-based digital assistance is being used across the globe by many hospitality companies. Through voice-based digital services, a visitor/guest can make quick reception desk requests, automate room control, do hands-free calling, among other advantages. Guests can further set the ambiance of the room according to their mood and vibe by regulating temperature, lighting, etc. through speech recognition and voice command.
- **Advanced personalization:** With the help of AI, customers are being able to customize travel and journey experiences to a large extent. Through machine learning and data science, travelers get recommendations as per their needs. Tourist recommendation system provide customers with suggestions tailored to

their needs. These systems enhance decision-making and planning, and better schedule procedures for customers. Moreover, AI-driven products for marketing and promotional campaigns can be used to send targeted messages and emails. Discounts/offers could be communicated to the most valuable customers through the use of AI.

- **Data processing and analysis:** One of the most crucial ways in which AI helps industries is data collection and analysis. Travel and tourism industry, with thousands of travelers visiting in a month, need assistance with data. AI sorts through huge amounts of data quickly. This benefits the hospitality industry as time and efforts of their human resources are saved and could be used at other touchpoints where human touch is required. Furthermore, the data is more accurate. This data then provides insights into human behavior. It is used to draw conclusions about business services, practices and pricing strategies. With AI, businesses could increase their conversion rates.
- **Predictive applications:** Advanced AI-driven applications are being used to forecast flights and travel related needs like hotels, transportation, etc. Statistical models explaining emerging trends from different segments of the travel industry are analyzed to give such predictions. Through the forecasts, travelers become aware about the best time to book flights and hotel rooms.
- **Facial recognition:** Facial recognition technology is being widely used in hospitality industry nowadays. Put in use for safety purposes and legal requirements, facial identification also helps people save time at airports, train stations, hotels, restaurants and large conferences and meetings. It recognizes people with saved feature visuals in the database from their last visit and shortens the process.
- **Robots:** Robots are being widely used in the hospitality industry to reduce human burden, intervention and ensure efficiency in services. Robotic technologies are used to speed up check ins, assist with other activities like housekeeping, baggage handling, etc. Robots are also capable of providing travelers and tourist with information that is required through AI and machine learning. All this in their native language through embedded translation software. Furthermore, hotels use them to store tons of data about their clients for a more personalized experience. AI is changing travel industry through superior automated products and services.
- **AI-based sentiment analysis tools :** Feedbacks given by travelers on different review platforms, through travel blogs, or social media are crucial to businesses in hospitality industry as well as other tourists and travelers. Text based comments, reviews and feedbacks are analyzed through machine learning algorithms and language technologies to understand customer experience and better services. Such data is highly beneficial for hotels, travel companies and agencies to evaluate the effectiveness of services and taking steps towards making required improvements.

3.3 AI & the Future of Travel and Tourism:

The travel and tourism industry is poised to undergo a massive transformation in the coming years. With the rise of artificial intelligence (AI), the possibilities for travelers and tour operators are endless.

- **Smart travel in smart cities:** Soon travelers wouldn't be exploring cities, they would be exploring 'smart cities', rather more smartly. Cities would transition into smart cities with sensors to collect and manage data related information like traffic and tourist flows, pollution levels, etc. within a city. Input would be provided by them highlighting how to create better synergies between these factors in order run a city more efficiently. Although, this would be mainly done through Internet of Things (IoT), AI will be used to analyze the huge amounts of data collected.
- **Self-driving cars:** Future would witness more cities adapting to the use of self-driving cars, buses and taxis. This would leave no room for human callousness or error while driving on roads and thereby reduce road accidents. It would further lead to less traffic jams that are caused by oblivious human drivers and their improper driving habits. AI technologies power self-driving cars. Hence, AI would change the way locals and travelers explore the cities.

4. Pioneering Experiences and Applications of of the Fourth Industrial Revolution in Tourism:

This section will showcase pioneering experiences and applications of Artificial Intelligence (AI) in the tourism sector.

4.1 Pioneering experiences in transitioning towards smart cities and smart tourism:

Several countries around the world have successfully utilized artificial intelligence in the tourism sector. These countries have harnessed the power of artificial intelligence in the tourism sector, particularly in the context of creating smart cities that support the industry.

4.1.1 Innovative Global Experiences in the Evolution towards Smart Cities and Tourism:

Several countries around the world have succeeded in employing artificial intelligence in the tourism sector, particularly in the context of creating smart cities. These pioneering experiences have led to significant advancements in enhancing the quality of tourism services and improving the overall travel experience (Lai,2023).

- **Singapore:** Singapore's position as one of the world's leading smart cities is widely attributed to its pioneering status in the technology field. The Smart Nation program, launched in 2014, is a comprehensive initiative aimed at facilitating the installation of numerous sensors throughout the city to collect voluminous data on the daily activities of citizens. The ultimate goal of this initiative is to streamline traffic flow, oversee all aspects of city operations, and implement intelligent waste management solutions. What sets Singapore apart, however, is the centralized

storage of all data with the government, rather than any single private entity.

- **Helsinki, Finland:** Helsinki has set themselves an aim of going carbon neutral by 2035 and they are proved to be on their way in reaching the goal. Even back in 2017, the city managed to lower emissions by 27% than it was in 1990. Another goal Helsinki is working towards is reducing traffic emissions by 69% within three decades by 2035, with measures like transitioning the entire city bus fleet to electric, and expanding its Metro and electric car charging networks. Since heating accounts for more than half of Helsinki's emissions, the city is focused on implementing energy-efficiency measures during renovations, which could reduce emissions from buildings by 80%, as well as incorporating more renewable energy use in the city's buildings.
- **Zurich, Switzerland:** For Zurich, it all started with a streetlight project. The city introduced a series of streetlights that adapted to traffic levels using sensors, which increased its brightness or dim accordingly. The project enabled an energy saving of up to 70%. Since then, Zurich has expanded its smart streetlights across the city, and established a greater range of sensory technologies that can collect environmental data, measure the flow of traffic and act as a public WiFi antenna. A smart building management system, which connects the city's heating, electricity and cooling has been shown to be highly effective as well.
- **Oslo, Norway:** The Norwegian capital is going all in with electric cars and plans for all vehicles in the entire city to go electric by 2025, which is impressive considering its population of approximately 670,000 citizens. Incentives for zero-emission cars have already been put in place, including free parking, the use of bus lanes, and lower taxes and prices at tolls. As part of the city's target for becoming carbon neutral by 2050, other smart projects are also already well underway in Oslo including zero-emission construction sites and retrofitting existing buildings to develop circular waste management and green energy systems.
- **Amsterdam, The Netherlands :** Amsterdam's smart city project started in 2009 and features more than 170 different operations across the city. What particularly stood out for Amsterdam is its ability to stay innovative, whether it's the utilisation of renewable energy for electric garbage trucks, installing solar-powered bus stops, billboards and lights, or constructing floating villages to combat overcrowding and provide an alternative to land reclamation. Throughout the city, thousands of operating businesses and households have already been modified with energy efficient roofing insulation, automatically dimming light switches, smart meters, and ultra-low energy LED lights.
- **Tokyo, Japan:** is a renowned leader in advanced technology and modern methods, earning it the nickname "Japan Planet." The city is focusing on becoming one of the best smart cities, and its policies reflect this goal. Presently, the city's administration is working towards the implementation of technologies that will increase efficiency and environmental sustainability, such as local energy storage and the promotion of electric vehicles.
- **New York, United States:** Hundreds of smart sensors and technologies have been tested and placed through the different districts in New York City as part of its

smart city pilot programme in 2020. The programme amasses data to help manage services like waste management and collection more efficiently. New York has also seen the introduction of smart hubs with contactless technology, WiFi capabilities as well as online charging stations in place of phone booths. Car sharing services are also huge in the Big Apple, which helps reduce total emissions and traffic congestions. As an attempt to culminate more local perspectives and creativity, New York City holds an annual contest – with a generous cash prize – for apps that best utilise the city's open data sets.

- **Seoul, South Korea :**Home to **Songdo**, also known as the world's first smart city, Seoul's smart technology campaigns have only gone from strength to strength since launching its initiatives as early as 2014. Data is at the heart of Seoul's smart city projects. Through the accumulation and analysis of urban patterns such as traffic flow, speed and air quality measured by sensors and CCTV deployed across the city, form a strong basis for a smart infrastructure and services. Focusing the technology towards the city's ageing population, a safety initiative was launched in aid of senior citizens who live alone. When there's no movement detected over a certain period of time or if abnormal temperature, humidity, or lighting are picked up by environmental sensors, relevant case workers and emergency services would be contacted immediately. Likewise, Seoul is looking into using the data platform creating an AI detective to flag up potential crime patterns. At the moment, thanks to the 5G network, the Korean capital is also amongst the first cities to utilise 5G technology in mobility and transportation.

4.1.2 Leading Arab experiences in the transition towards smart cities and smart tourism:

Some Arab countries have succeeded in utilizing artificial intelligence in the tourism sector by creating smart cities.

4.1.2.1 Experiences of some Gulf countries in digital, smart tourism:

Gulf countries have succeeded in utilizing artificial intelligence in the tourism sector through the creation of smart cities.

- **Saudi Arabia is following global trends with its "Digital Tourism Strategy":** The launch of the "Digital Tourism Strategy" by the Kingdom of Saudi Arabia is unsurprising, given the ongoing global trend towards digitization in the tourism sector, driven by technological advancements and the far-reaching impacts of the COVID-19 pandemic. The "Digital Tourism Strategy" has garnered support from the World Tourism Organization, the World Bank, and digital partners including Microsoft and Cisco. The strategy focuses on a range of key pillars, including streamlining travel through digital solutions, facilitating business processes by launching a unified platform to link tourism service providers and applications, promoting innovation through an interactive environment that fosters experimentation with new digital tourism solutions, supporting tourism applications of extended reality such as virtual and augmented reality, incentivizing sustainable tourism practices, developing solutions for data collection and analysis in the

tourism sector, cultivating a professional digital workforce through the creation of a generation of professionals and entrepreneurs in the tourism industry, and leveraging AI and data technologies to attract investors, enhance destination readiness, and highlight available investment opportunities. The "Digital Tourism Strategy" is a notable initiative by the Kingdom of Saudi Arabia that aims to stay on the global forefront of digital tourism and reap its potential benefits.

- **Qatar's experience:** Qatar has emerged as a pioneer in digital transformation, exemplified by its implementation of several initiatives aimed at optimizing operations. Notably, the e-licensing system enables institutions to apply for and renew licenses within a remarkably short time frame of 24 hours. This platform provides a significant advantage to investors in the burgeoning tourism sector, which has experienced considerable expansion in recent years. The hotel industry has also made notable strides, backed by support from Qatar's regulatory bodies in opening up new markets. Consequently, Doha has become a coveted destination for hosting international events such as weddings and parties, particularly following visa facilitation decisions.
- **The Emirati Experience of Smart Tourism: A Promising Gateway towards Sustainable Development:** The United Arab Emirates (UAE) has emerged as a significant player on the global stage and has established itself as a key participant in the global shift towards sustainable development. Its success is evidenced by its position as one of the world's top tourist destinations, a feat accomplished through a well-designed developmental plan centered on smart tourism. This plan encompasses a range of smart tourism initiatives, including the creation of exceptional architectural wonders as part of smart cities, such as the world-renowned Burj Khalifa and Emirates Palace, as well as a broad network of smart transportation options, technologically advanced resorts, Palm Islands, Ski Dubai, and the underwater Atlantis hotel (Boulaid & Karkar, 2021, p. 175).
- **The experience of Dubai:** Dubai stands out as a preeminent model for the implementation of smart technologies, effectively creating a smart city that has helped to cultivate smart tourism. Several initiatives have contributed to this success, including the enhancement of Dubai's reputation as a leading global smart economy, which supports entrepreneurship and global competitiveness. Additionally, Dubai has worked to build a smart community based on the individual at the center of the city, supporting the education sector. Further, Dubai has created a digital government through the digitization of activities, jobs, and institutions. The city provides a smart environment through intelligent resource utilization and effective waste management, and has adopted smart transportation as an initiative to develop infrastructure and improve the quality of life for citizens. Smart tourism in Dubai has emerged and flourished due to the success of the Smart City initiative, which leverages the power of the Internet of Things(IoT), cloud computing, and open data. The impact of these efforts is reflected in the advanced rankings Dubai has achieved in the Travel and Tourism Competitiveness Index, as highlighted in Table 01.

Table N°01: The competitiveness index of Dubai's tourism and travel industry in 2017

Indicators	Results
Number of international tourists arrivals	14200000
International tourism revenue	16.038 billion US dollars
Average revenue per arrival	1.129 US dollars
Contribution of tourism to employment	329,772 employees (5.7%)
Contribution of tourism to GDP	17.661 billion US dollars (4%)
Ease of doing business index	Ranking: 05
Safety and security index	Ranking: 02
Health and hygiene index	Ranking: 63
Information and communication technology readiness index	Ranking: 15
Tourism and travel prioritization index	Ranking: 21
International openness index	Ranking: 75
Price competitiveness index	Ranking: 56
Environmental sustainability index	Ranking: 40
Air transport infrastructure index	Ranking: 03
Maritime transport infrastructure index	Ranking: 19
Tourism service infrastructure index	Ranking: 27

Source: Boutagrin & Ayachi, 2022, p. 72.

- **Egypt's experience in smart cities and smart tourism:** Egypt is making significant strides in the development of smart cities, with several ambitious projects currently underway. At the forefront is the New Administrative Capital, which is being constructed according to the standards of fourth-generation cities and designed with global specifications. It is set to become one of the world's largest capitals, accommodating 40 million inhabitants by 2050. The city features advanced technology for managing facilities and infrastructure, including surveillance cameras in all streets and an underground system for smart waste recycling.

  Another noteworthy project is the Al Galala Mountain Development Project, which cleverly combines tourism and innovation. Despite its mountainous terrain, the city has been thoughtfully designed to offer visitors a year-round experience. It boasts two universities, King Salman and Al Galala, that are equipped with the latest scientific systems and modern technologies.

  The New Alamein City is another promising development, built with the specifications of fourth-generation cities. It features a modern infrastructure that relies on cutting-edge technology for managing facilities and infrastructure. Surveillance cameras are installed throughout the city, and an underground system for smart waste recycling is also in place.

  The New Ismailia City, an extension of the current Ismailia, is an accessible and inclusive smart city. Designed with people with special needs in mind, the city features accessible roads, entertainment venues, doors, and elevators. It is also the first city in Egypt where solar energy is integrated with electricity.

The New 6th of October City, the latest fourth-generation city, offers a plethora of amenities, including multiple parks, a medical center, malls, and security services. Separated from the current 6th of October City by only one street, it is a promising development that showcases modern technology and design.

The New Mansoura City, the first smart city belonging to fourth-generation cities in the Delta region, boasts distinctive designs and strong infrastructure. Finally, the city of Salam Misr (New Port Said City) is currently the largest project under construction by the state on the northern coast of Sinai, with plans to become Egypt's new economic capital. It relies on modern technology in communications and information technology and includes the largest water desalination station in Egypt and Africa, as well as a global trade port, hotels, and tourist resorts. The Urban Communities Authority is constructing the new Al-Obour City to become a new urban community in a prime location with high-level services, built according to the standards of fourth-generation cities. Representing an integrated urban community, the new Rafah City provides a decent life for the governorate's residents and attracts investments. The New Toshka City is a comprehensive city located approximately 55 kilometers from the High Dam and 90 kilometers from the city of Abu Simbel. (Egypt's experience in smart cities and smart tourism (Property Finder Egypt, 2022)

4.2 The world's leading smart tourism applications:

Smart applications refer to the supporting technology for mobile phones such as parameters, operating systems, and specialized software for display, based on the mobile phone. The leading smart tourism applications in the world are as follow:

- **Expedia:**hh is an online travel agency owned by Expedia Group.The website and mobile app can be used to book airline tickets, hotel reservations, car rentals, cruise ships, and vacation packages. It aims to provide the lowest prices for any booking, which is backed up with the "Best Price Guarantee." Expedia.com was launched on October 22, 1996 by Microsoft. It began accepting Bitcoin for payment in 2014.
- **Booking:** Online booking platforms give much convenience and offer a win-win solution for both businesses and customers. Business owners are able to control their bookings within one app and users can make arrangements and reservations effortlessly.
- **Priceline:** Priceline is an app for finding the cheapest flights, the best hotels, and the best rental cars. This app gives access to exclusive offers, with discounts of up to 60% for some of the flash sales. The Priceline interface is divided into three very distinct tabs. From the first one, you can search for hotels; from the second one, you can search for rental cars; and from the third one, you can search for flights. Each of these three tabs has its own special search filters to help you find exactly what you're looking for.
- **Agoda:** Agoda is an online travel platform and part of Booking Holdings Inc., the world leader in online travel & related services. It brings high-value and rewarding travel experiences to people all over the world through the Agoda app and Agoda

website. Its mission is to empower everyone to be a traveler by offering affordable deals on hotels, flights, activities, and more.

- **Kayak:** It provides consumers with travel information and rates on vacation packages, flights, hotels, rental cars, and other travel services by offering information collected from travel suppliers and travel agencies.
- **Cheapflight:** is a free airline search engine that helps to compare airfare and book cheap flights from hundreds of airlines and travel agents globally.
- **Skyscanner:** is a metasearch engine and travel agency based in Edinburgh, Scotland. The site is available in over 30 languages and is used by 100 million people per month. The company lets people research and book travel options for their trips, including flights, hotels and car hire.
- **Google Travel:** is an app that lets users book trips and manage itineraries. The Silicon Valley giant introduced the service in 2016, and it was known as Google Trips. Unlike several other Google apps, including Drive and Docs, Google Travel cannot be downloaded as a standalone mobile app for smartphone. Instead, it is used in a web browser; it can be done from either a phone, desktop, or tablet.
- **Google Maps:** is a web service that provides detailed information about geographical regions and sites worldwide. In addition to conventional road maps, Google Maps offers aerial and satellite views of many locations. In some cities, Google Maps offers street views comprising photographs taken from vehicles.
- **Trivago:** is an app instantly compares millions of hotels worldwide, from hundreds of booking sites. All you have to do is search by city, address or point of interest, to find your ideal hotel at a great price.
- **City Mapper:** is a public transit app and mapping service which displays transport options, usually with live timing, between any two locations in a supported city. It integrates data for all urban modes of transport, including walking, cycling and driving, in addition to public transport.
- **Uber:** is a transportation company with an app that allows passengers to hail a ride and drivers to charge fares and get paid. More specifically, Uber is a ridesharing company that hires independent contractors as drivers.

5. The reality of Algeria's experience in the tourism sector in light of the Fourth Industrial Revolution:

Tourism in Algeria is characterized by a set of factors and obstacles that hinder the success of digitizing the sector.

5.1. Challenges of Digitization in Tourism in Algeria:

The challenges of utilizing artificial intelligence in tourism in Algeria are represented in various aspects.

5.1.1. Challenges of establishing electronic tourism in Algeria:

The advent of electronic tourism is intertwined with the emergence of electronic commerce, thus making the progress and expansion of tourism dependent on the advancement of online marketing and commerce. In Algeria, electronic commerce is lagging behind other countries, which translates into a weakness in electronic tourism, as

it is an integral part of e-commerce. Several shortcomings and obstacles hinder the growth of electronic tourism in Algeria, such as the absence of sales through specialized electronic websites, which directly undermines its potential. Additionally, the pace of digital transactions and electronic commerce in Algeria is sluggish. From the viewpoint of the World Tourism Organization, tourism agencies are still not competitive enough, and their websites lack contemporary applications. Moreover, tourism actors have failed to keep pace with advancements in information and communication technology. Another obstacle is the absence of an approach between the tourism and banking sectors, which has resulted in tourism establishments losing numerous customers. Therefore, relying solely on electronic reservation is inadequate to ensure the tourist's loyalty to a destination in the face of strong foreign competition.

5.1.2.Challenges of establishing smart tourism in Algeria:

Algerian cities are distinctly removed from the phenomenon of artificial intelligence, encompassing its varied dimensions and manifestations. These cities are bereft of soul and beauty, while also lacking all essential requirements of a smart city, in terms of technology and services, due to their geographic isolation, closure, and insufficient integration. The Algerian cities were primarily constructed to accommodate housing, rather than becoming productive, vibrant spaces for cooperation, solidarity, and creativity. The majority of smart applications are not interactive, and their marketing and promotional aspects are poorly conceived, haphazard, and unprofessional, often relying solely on a single language. Moreover, smart tourism applications often suffer from weak content, as well as organizational challenges, steep website creation costs, rapid changes in electronic platforms, linguistic barriers, privacy and security concerns, lack of trust in electronic payment methods, and absence of cooperation between the tourism and banking sectors (Ben Reguia, 2021, pp. 98-99).

5.2. Requirements and means of promoting electronic tourism in Algeria:

The requirements and means to promote electronic tourism in Algeria are as follows:

5.2.1. Requirements for the establishment of electronic tourism in Algeria:

To achieve the prosperity of electronic tourism in Algeria, a comprehensive set of requirements must be fulfilled. These include the provision of e-commerce capabilities across various transactions, advancement in the field of information and communication technology infrastructure, prioritizing e-marketing strategies, instituting transformative shifts in the organizational culture of institutions, facilitating the development of an instant translation system within electronic sites offering tourism services, and encouraging widespread adoption of internet marketing among customers (Kouache & Kamraoui, 2013, p. 44).

5.2.2. Means of promoting electronic tourism in Algeria:

To foster the development of electronic tourism in Algeria, there is a need to focus on several key areas, such as : enhancing the tourism product and the capacity of local tourism institutions, improving the infrastructure of information and communication technologies, revising the pricing strategies for tourism products, given their high cost in comparison to neighboring countries, and establishing a clear legal framework for electronic commerce and tourism. These measures would be crucial to ensure the growth

and success of electronic tourism in Algeria, enabling the country to compete effectively in the global tourism market and attract more visitors to its diverse and rich cultural offerings.

6. CONCLUSION:

The present research paper illuminated the tourism sector as a significant contributor to economic diversification. As a service-based industry, tourism has undergone various transformations, elevating it from a mundane activity to a luxurious and enjoyable experience that reflects an improved quality of life. The fourth industrial revolution, marked by the widespread use of modern technologies such as digital transformation and artificial intelligence, has impacted all sectors, including tourism. The COVID19 pandemic has highlighted the inadequacies of traditional transaction methods, leading to significant losses in countries that relied on them. Conversely, those who adopted digitalization have enjoyed competitive advantages, including economic savings and continuity of work.

The integration of digitalization and artificial intelligence into the tourism sector has introduced new concepts and visions aimed at eliminating negative aspects of traditional tourism. Advanced technology, such as vast databases and specialized infrastructure, provides services that cater primarily to international tourists and not locals, thereby supporting sustainable development, reducing emissions, and promoting positive behaviors. Several countries worldwide have successfully adopted this approach by building smart cities that reflect wealth creation, increased prosperity, and competition, particularly through their connection to the smart tourism sector. This integration has facilitated the tourist experience, met their expectations, and provided smart digital tourism services that allow them to benefit from the advantages of digitization and artificial intelligence, such as cost reduction, increased responsiveness, and keeping up with scientific and technological advancements.

Among the successful countries are those that have employed smart technologies, such as robots that interact with tourists like any ordinary person, providing them with the necessary assistance despite language and cultural differences, creating a premium tourism experience.

It is worth noting that Algeria, despite its abundance of potential tourist attractions, lags behind in the digitalization of its tourism sector. The absence of infrastructure, social awareness, and governmental initiative hinders the seamless transition towards a digitized tourism industry, especially in light of the widespread use of smartphones and travelers' expectations for a hassle-free and enjoyable experience. Achieving the highest level of luxury and well-being for tourists is paramount. This is where artificial intelligence plays a significant role by simplifying the tourist experience, ensuring safety during travels, and providing relevant information about intended destinations in a smooth and seamless manner, without any disruptions.

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