

The Impact of Digitalization on Tourism Sustainability: Comparative Study between Selected Developed and Developing Countries

Noha Abouzeid

Helwan University, Cairo

Abstract:

There are two stimuli that are driving the whole world to a different place, which are, technology and sustainable development. When it comes to technology, the use of web analytics and computers transfer human information and preferences to be evaluated and personalized to work for the needs of the users. Regarding sustainable development, it makes the entire human society evolve in a way that benefit the society, economy, and the environment to be friendly and beneficial to both current and future generations. Tourism is one of the first industries to digitalize business processes on a worldwide scale, pioneering the online booking of flights and hotels, as it was one of the early sectors that got use of new technologies and platforms as information and communications technology (ICT) became a global phenomena. To maintain its competitiveness, growth, and long-term development, a digitalized tourism must innovate and create new business prospects, where the major goal is the contribution to the United Nations' Sustainable Development Goals (SDGs).

The use of technologies such as the 'Internet of Things,' location-based services, artificial intelligence, augmented and virtual reality, and blockchain technology has resulted in a tourism sector that is more appealing, efficient, and economically, socially, as well as environmentally sustainable than before. It has also aided in providing smarter destinations by facilitating innovation and solutions to sector's problems such as seasonality and overcrowding. A strategy embedding technology, innovation, sustainability, accessibility and inclusivity forms a complete tourism cycle, as the future of travel is technology-based, also tourism jobs that will require both technical and advanced skills, where 1 in every 10 jobs worldwide will be affected by digitalization and will help in generating new employment opportunities.

Regarding sustainability, the wide reach of tourism into different sectors such as infrastructure, energy, transport and sanitation, and the huge impact of the sector on job creation, make it as an essential contributor to 2030 Agenda for Sustainable Development. Governments has a major role in connecting startups with investors to facilitate innovation, entrepreneurship, employment.

This research will study the impact of digitalization on tourism and sustainability by using an econometric model, also will check the impact of technology in tourism sector and how this will impact the SDGs, the study will also include analysis of both developed and developing

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

Milan, Italy

countries, and how technology and digitalization impact the tourism sector in the selected countries.

Keywords: sustainability, SDGs 2030, blockchain, digital tourism, COVID-19.

1. Introduction:

The economy and society have been transformed by the digital revolution. The growth of a linked economy, marked by widespread Internet use and the deployment of broadband networks, occurred first. The growth of a digital economy was then followed by the increased usage of digital platforms as business models for the supply of goods and services. The current trend is toward a digitalized economy, in which all economic, social, and environmental components of production and consumption are based on the integration of digital technologies.

Digital technologies have expanded at an exponential rate, and their use has spread all over the world. As a result of the massive use of smartphones and the consequent access to information, social networks, and audiovisual entertainment, most of humans now has constant and continuous connectedness. The rapid advancement of technology in the digital sphere has made the usage of cloud computing, big data analysis, blockchains, and artificial intelligence in devices and applications commonplace. The technological revolution, along with a shift in the strategy of enterprises at the forefront of digital technology use, has resulted in a significant growth in the role of global platforms, resulting in excessive economic amplification.

COVID-19 pandemic has driven the globe to its biggest economic crisis since the second world war, with all the consequences for jobs, wages, and the fight against poverty and inequality. Digital technology has been critical in combating the pandemic's consequences. However, structural obstacles like internet connection including access, use, and speed, social disparities, productive heterogeneity and low competitiveness, and restricted access to data and information management, among others, limit the benefits of its utilization.¹ Regarding tourism, the pandemic made it harder for countries to welcome mass tourism. Currently, some countries and tourism activities are embracing the new normal, however, in many regions of the world, the situation remains critical. The tourism industry requires significant changes to cope with potential tourists, and technological advancement is the industry's most promising future. For increasing the effectiveness of the tourism industry, we can better utilize technology and information technology (I.T.) development by using virtual reality, which is one of the industrial revolution's modern advancements, where it provides virtual tourism that is a better and safer option, it also helps in enhancing virtual travel, allowing people to experience new

¹ United Nations, (2021), "Digital Technologies for New Future", ECLAC 2022, P.7.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

destinations without leaving their homes.² Through the development of solutions for the energy, manufacturing, agriculture and natural resource extraction, construction, services, transportation, and traffic management sectors, advanced technologies such as 5G, the Internet of Things, and artificial intelligence should help reduce global carbon emissions by up to 15%, or nearly a third of the 50% reduction proposed for 2030.³

This study assumes that there is a direct impact of digitalization on tourism sustainability, as digital innovations contribute to sustainable development by lowering environmental impacts and optimizing resource utilization. The hypothesis of the study is indicating a favorable impact of digitalization on tourism sustainability, where the use of the internet makes tourism gain a larger share of the online trade market in the tourism sector, that is reflected by tourism receipts, the hypothesis will be divided into two sub hypotheses that state:

H1: Digitalization has a positive impact on tourism sector in the developed countries and this contributes positively to sustainability.

H2: Digitalization has a positive impact on tourism sector in the developing countries and this contributes positively to sustainability.

2. Literature Review:

Research in tourism field nowadays has been focusing on the created applications of high technology for marketing goals through mobile phones, mobile apps, and virtual reality, which are examples of technology that can be used for marketing objectives and locations. Virtual reality is one of the most innovative mediums.

There is a positive and negative impact of digitalization on the environment, where digitalization has the potential to dematerialize the economy by facilitating the delivery of digital goods and services, which are becoming an increasingly important element of the economy and exports; as the importance of digitally supplied services grows, so do movements and emissions. Increasing digital progress, on the other hand, has negative consequences on the environment due to the increased energy consumption, polluting hardware (screen) manufacturing processes, and marketing models that incentivize quick gadget replacement.

(Bănescu et al., 2021), studied the impact of digitalization on tourism services that is investigated using panel data regression models, which estimate how the percentage of people

² Akhtar, N.; Khan, N.; Mahroof Khan, M.; Ashraf, S.; Hashmi, M.S.; Khan, M.M.; Hishan, S.S. (2021), "Post-COVID 19 Tourism: Will Digital Tourism Replace Mass Tourism?" *Sustainability* 2021, 13, 5352, P.3. <https://doi.org/10.3390/su13105352>

³ United Nations, (2021), "Digital Technologies for New Future", ECLAC 2022, P.15.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

who plan their trips online is affected by economic development, education, and Internet knowledge, as well as the security and safety of ICT infrastructure. The data covers 29 European countries over the period (2010-2018), the study showed that Western European countries with a high level of economic development have a favorable attitude toward digitalization in tourism, whereas Eastern European countries with a lower level of economic development, primarily former communist countries, have a negative attitude toward digitalization in tourism.⁴

(Saseanu et al., 2020), analyzed the impact of digitization on visitor preferences for accommodation and economic well-being, assuming sustainability, the study was conducted by using regression analysis and principal component analysis. As tourist preferences for green destinations and ecological accommodation places, as well as Internet use in travel planning, have a substantial impact on tourism sustainability. This study included 30 European countries' behavioral models in terms of sustainable tourism and digitalization and presented recommendations for economic and social policy measures to maintain the long-term viability of the industry.⁵

Virtual Reality is one of the major components that is shaping the future of digitalized tourism sector, where virtual things are displayed in the actual world using augmented reality devices, this may include travel assistants that guide users through complex public transportation systems, which is used to replace paper-based marketing and advertising materials, also gamification and augmented visitor experiences in the destination can enrich the visitor's experience.⁶ Some researchers as (Tussyadiah et al., 2017) have argued that virtual reality in tourism provides more engaging content for tourists. It's also changing people's perceptions and intentions about destination travel in a positive way by boosting tourists' enjoyment of the VR experience through the virtual environment.⁷

⁴ Bănescu, C., Boboc, C., Ghiță, S. and Vasile, V., 2021. Tourism in Digital Era. In: R. Pamfilie, V. Dinu, L. Tăchiciu, D. Pleșea, C. Vasiliu eds. 2021. 7th BASIQ International Conference on New Trends in Sustainable Business and Consumption. Foggia, Italy, 3-5 June 2021. Bucharest: ASE, pp. 126-134 DOI: 10.24818/BASIQ/2021/07/016

⁵ Saseanu, A., Ghita, S., Albastroiu, I., Stoian, C., (2020), "Aspects of Digitalization and Related Impact on Green Tourism in European Countries", Information 2020, 11, 507; doi:10.3390/info11110507, P.3.

⁶ OECD ilibrary, (2021), "OECD Tourism Trends and Polices 2020", Chapter 2, <https://www.oecd-ilibrary.org/sites/f528d444-en/index.html?itemId=/content/component/f528d444-en>

⁷ Tussyadiah, I, Wang, D., Jung, T., Dieck, M. (2018), "Virtual Reality, Presence, and Attitude Change: Empirical Evidence from Tourism", Tourism Management, PP. 4-7.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

(Zarzuela et al., 2013) show how educational tourism can be built in a fun and entertaining way using a VR Serious Game, implying a link between VR involvement and enjoyment, to allow tourists to learn about different features of a city.⁸

According to (Hojeghan, 2011), governments play an essential role in supporting the use of electronic commerce in the tourism industry and boosting their potential benefits. The two most important requirements for conducting effective e-commerce are "security of the e-commerce system" and "user-friendly Web interface," recognizing the importance of client trust and ease. Despite its rapid expansion in recent years, we see e-commerce as a significant trend that is only a part of the larger shifting structure of the economy by profound improvements in the information technology.⁹

(Sylaiou et al., 2010) looked at the relationship between the presence in a virtual museum, and the enjoyment level received and found that there is a substantial positive relationship between the two variables, where this indicates the possibility of the presence during a VR experience with a tourism location and the VR experience's satisfaction.¹⁰

E-commerce is another component that is shaping the future of digitalized tourism sector, where it refers to a service that is offering people the opportunity to do their shopping via modern information and communication technologies at home¹¹

(Ying, 2017) examined the impact of tourism e-commerce on domestic tourism development and make reasonable recommendations for how to encourage tourism e-commerce development to better influence tourism development. The study found that there is a positive impact of tourism e-commerce on tourism development and has widely recognized that it is feasible to rely on tourism e-commerce for the development of the tourism sector. Fostering the growth of tourism e-commerce requires government backing as well as widespread

⁸ Zarzuela, M., Pernas, F., Calzón, S., Ortega, D., Rodríguez, M. (2013), "Educational Tourism Through a Virtual Reality Platform", 2013 International Conference on Virtual and Augmented Reality in Education, PP. 383-385.

⁹ Hojeghan, S., Esfangareh, A., (2011), "Digital economy and tourism impacts, influences and challenges", *Procedia Social and Behavioral Sciences* 19 (2011), pp. 308–316.

¹⁰ Sylaiou, S., Mania, K., Karoulis, A., White, M. (2010), "Exploring the relationship between presence and enjoyment in a virtual museum", *Int. J. Human-Computer Studies* 68 (2010) 243–253, PP.243-253.

¹¹ All Answers Ltd. (November 2018). Ecommerce in Tourism Industry. Retrieved from <https://ukdiss.com/examples/ecommerce.php?vref=1>

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

Milan, Italy

engagement from tourism businesses, and the growth of tourism e-commerce necessitates improved planning. Under the new economic growth benchmarks.¹²

One other form of digitalization is the usage of cloud computing and the construction of mobile technologies, (Kim, 2017), determine the state and function of mobile technology in attaining sustainable and smart tourism. The study indicates that advances in mobile technology are expected to create novel experiences for consumers as a result of advances in mobile technology, as well as a sustained competitive advantage for tourism destinations and tourism-related providers and the development of smart tourism competences.

Consumers use mobile devices and mapping systems to get enough information, plan routes to destinations, they can take advantage of opportunities and create value by adopting mobile technologies. Destinations determination by tourists can employ data collection and big data processing technology based on sensors to assess and respond to potential harmful environmental effects ahead of time, where firms, as suppliers, can add economic value by offering personalized information derived from context-aware data obtained based on the customers' lifestyle and location."¹³

(Buhalis & Amaranggana, 2014) studied the benefit from the advancement of smart cities by developing a framework for smart tourist destinations by investigating tourism applications in the destination and addressing both opportunities and obstacles, where tourism has been one of the fastest expanding economic sectors in recent years, the industry must stay up with the latest technologies. (UNWTO, 2016) predicted that the number of tourists arriving and utilizing the internet to book vacations increased by 4.6 percent (or 52 million individuals) in 2015. Simultaneously, the rapid advancement of information technologies, particularly via the cloud introduced a new paradigm of smartness in all aspects of human life.¹⁴

¹² Ying, M., (2017), "Analysis of the impact of tourism e-commerce on the development of China's tourism industry", *Advances in Economics, Business and Management Research*, volume 48, PP.239-243

¹³ Kim, D., Kim, S. (2017), "The Role of Mobile Technology in Tourism: Patents, Articles, News, and Mobile Tour App Reviews", *Sustainability* 2017, 9, 2082; doi:10.3390/su9112082, P.2.

¹⁴ Buhalis, D and Amaranggana, A., (2014), "Smart tourism destinations" Z. Xiang and I. Tussyadiah (eds.), *Information and Communication Technologies in Tourism 2014*, DOI: 10.1007/978-3-319-03973-2_40, Springer International Publishing Switzerland 2013, PP. 553- 562.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

Milan, Italy

Big data and analytics are anticipated to be the most significant technology shaping of the travel industry in the next five years, according to one of the most recent Euromonitor International travel industry reports.¹⁵

(Yallop & Seraphin, 2020) examined the growing technology trend of big data and analytics in travel and hospitality industry and determined potential opportunities and threats. While big data is widely thought to be useful to tourist and hospitality businesses, it is some ethical privacy, and security concerns. This paper argues that more research on data governance and data ethics in tourism and hospitality is needed, to effectively use data for competitive advantage, where tourism and hospitality organizations must expand compliance-based data governance frameworks to include more effective privacy and ethics data solutions.¹⁶

Different sectors and industries, such as health, government, and tourism, have expressed a strong desire to adopt and utilize this cutting-edge technology, where online payments are conducted directly between two parties without the involvement of a financial institution. This notion was initially realized in the form of the well-known cryptocurrency Bitcoin that was introduced by (Nakamoto, 2008).¹⁷

The blockchain technology has appeared after then and its goal was to create a decentralized database of records in which all transactions and data are not controlled by a third party, where each transaction's information is shared among all participants, and is known as nodes; this feature ensures that the system is transparent, and data in this condition cannot be edited or erased, where the capacity to track transactions inside a decentralized databases, prevent fake operations to take place and fraud. Another important feature of blockchain technology is the anonymity, which makes transactions more secure for other nodes to confirm the conducted transactions instead of human monitoring and supervision, this is conducted by networked computation which allowed more security.¹⁸

(Tyan et al., 2020), constructed a study that aims at better knowledge of blockchain usage in the tourism industry, it has been successfully implemented by significant travel companies in the tourism industry. Companies which use blockchain technology in its booking, reservation,

¹⁵ Bremmer, C. (2019), "The voice of the industry: travel", Euromonitor International, available at: www.portal.euromonitor.com

¹⁶ Yallop, A., & Seraphin, H. (2020), "Big data and analytics in tourism and hospitality: opportunities and risks", JOURNAL OF TOURISM FUTURES, Emerald Publishing Limited, ISSN 2055-5911

¹⁷ Nakamoto, S. (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. <https://bitcoin.org/bitcoin.pdf>

¹⁸ Yli-Huumo J, Ko D, Choi S, Park S, Smolander K (2016). Where Is current research on blockchain technology?—A systematic review. PLoS ONE 11(10): e0163477. doi:10.1371/journal.pone.0163477

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

and payment systems like CheapAir, Expedia, and airBaltic, which accept bitcoin payments, and S7 Airlines, which uses blockchain infrastructure for issuing and selling tickets, are among the early adopters of blockchain technology that have successfully adopted the blockchain technology in tourism sector. When it comes to the impact of blockchain on the tourism industry, it demonstrates that blockchain technology will reduce costs in certain areas while increasing costs in others, resulting in organizational and market structure adaptation, which influences inter- and intra-organizational functions and management structures, which will eventually affect the company's competitiveness, by the appearance of the decentralized apps, DApps, and blockchain based products in tourism industry.¹⁹

2.3 Defining Sustainable Tourism:

According to the world tourism organization, sustainable tourism is defined as type of tourism that aims in achieving an appropriate balance between environmental, economic, and socio-cultural components of development, and is critical to biodiversity conservation. It has to participate to little impact on the environment and local culture so that it will be available for future generations, while also contributing to the development revenues, employment opportunities, and at the same time the preservation of local ecosystems.²⁰ Sustainable tourism increases tourism's positive contribution to biodiversity protection and, as a result, to poverty reduction and the fulfilment of common development goals. Revenues from visitor spending are frequently reinvested in environmental conservation or capacity-building programs to help local communities manage protected areas.²¹

The major goal of developing a sustainable tourism plan for a certain region is to increase the number of tourists while adhering to the principles of sustainable development. This goal can be met by a number of specific objectives, including coordination of all parties interested in the development of tourism in the region; consideration of the interests of local communities and the environment in shaping the tourism product and marketing activities; development of a vision, mission, and framework marketing plan activities for the region. So, in order to tackle sustainable tourism, there should be economic profitability side including maximizing the economic benefits of tourism to the local community, including the expenditure of tourists in the area, and regarding the environmental aspect, this includes two main sub objectives which are, effective waste management and clean environment, that target minimizing of the use of rare and non-renewable resources in the development of tourism; and minimizing of water, air, soil pollution and reduction of generating waste by tourists and tourist operators respectively.

¹⁹ Tyan, M. Yangüe, A. Guevara-Plaza. Blockchain Adoption in Tourism: Grounded Theory-Based Conceptual Model, vol10(1), PP. 68-89, ISSN:2014-4458

²⁰ Making Tourism More Sustainable - A Guide for Policy Makers, UNEP and UNWTO, 2005, p.11-12

²¹ UNWTO Website, 2022, <https://www.unwto.org/sustainable-development>

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

The third aspect is the socio-cultural that contain welfare of the community, cultural wealth and meeting the expectations of the visitors.²²

2.4 Digitalization and Tourism Sustainability in SDGs 2030:

Sustainable tourism which refers to "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities."²³ This needs to be achieved by all key players that are integrated in the tourism industry, as many territories have been deteriorated because of the uncontrolled growth of tourist flows and the failure to regulate or manage their access; businesses in their tourism chains which have continued to operate inefficiently, and the quality of life of domestic residents has invariably decreased. Over tourism has also increased visitor dissatisfaction, as tourists are unable to experience the "hospitality atmosphere as it should be.

We need to focus on tourism sustainability through the interactions among local actors including the community, the public and the private sector and the marketing choices that these actors make, as these are the key elements in the construction of sustainable tourism in destinations where natural resources are pull factors for the development of tourism.²⁴

Tourism generally has impact on majority of SDGs 2030 by a way or another, Tourism generates revenue and provides income sources through creating jobs at the domestic levels. Women also can be empowered by providing low skills job opportunities that increases the recruitment levels and this helps in achieving the 1st and the 5th as well as the 8th and 10th goal, which refers to ending poverty, achieving gender equality, promoting sustainable economic growth, and reducing inequality among countries respectively.

Regarding ending hunger, it also can help in promoting sustainable agriculture by encouraging the production and supply of local products to hotels, as well as selling of the domestic products to tourists. Agrotourism has the potential to produce additional revenue while also improving the value of the tourism experience. Through generated tourism's income tax, countries can use this income to be reinvested in the health care sector, this can improve the reduced rates of child mortality, enhancing the maternal health and preventing several diseases. With respect to goal 4 that ensures equitable quality education, tourism sector is helping in enhancing this

²² Florek, Iwona. (2012). Sustainable Tourism Development. Region formation and development studies - Journal of Social Sciences. 157-166. 10.1007/3-540-25815-9_16.

²³ UNWTO Website, 2021, <https://www.unwto.org>

²⁴ Buffa, U. (2020), "Marketing for Sustainable Tourism", Sustainability 2020, 12, 2014; doi:10.3390/su12052014, P.1.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

sector as this sector cannot thrive without a skilled staff, where it provides direct and indirect job vacancies of whom should benefit from educational opportunities.

This sector also has the potential to improve urban infrastructure, stimulate protection of cultural and natural heritage as well as marine resources through seas and oceans, also green infrastructure investment including more efficient transportation, lower air pollution that should result in smarter and greener communities for residents and tourists alike, where this promotes goal 6,7,9, 11, 14 and 15.²⁵

Technology and digital solutions are essential for achieving all these goals through tourism sector, the role of technology and new energy-efficient equipment is essential when it comes to companies that is engaged in tourism sector, where many of these companies aim to reduce weight by introducing lighter equipment such as seats, service carts, and cargo containers, as weight is a major driver of aircraft fuel efficiency. Airlines also want to lower their carbon footprint by using more energy-efficient technologies to help in lighting onboard or on the ground. Companies that operate cruise ships and ferries also are seeking to reduce hull water friction to improve fuel consumption. Some employ sea water to chill the ship and eliminate the need for air conditioning, while others implement new digital solutions to reduce pollutant exhaust emissions.

The digital economy is changing the way of communication with tourists and the way of providing tourism services and improving the tourist's experience. This is done through providing chances to use digital innovations in managing transactions, acquiring, and processing tourism supply and demand data, as well as optimizing and integrating operations across tourism value chains and ecosystems.²⁶

Increased use of online and mobile platforms to get information in the planning stage of the travel experience by using websites and social media, with decreased use of offline sources as the use of visitor information centers, print media and hotel concierge, there is a greater tendency to stay online and connected by searching and exploring, sharing experiences, and being updated, also this increased the use of e-commerce payment methods over the use of the cash.²⁷ It is obvious that millennials and Gen Z have a higher level of engagement in the sharing rather than ownership and this is seen in accommodation sharing, ride sharing, currency swapping, and crowdsourcing than prior generations.²⁸

Based on UNWTO and UNDP report, there are some challenges and threats that face tourism sector in achieving the 17 stated SDG, as SDGs 11, 12, and 14 on 'Sustainable Cities and Communities,' 'Responsible Production and Consumption,' and 'Life below Water,' are

²⁵ UNWTO, (2018), "Tourism and Sustainable Development Goals – Journey to 2030", P.2

²⁶ Skift, (2018), "The 2018 Digital Transformation Report", P. 20.

²⁷ Visa, (2017), "VISA Annual Report", P.11

²⁸ OECD ilibrary, (2021), "OECD Tourism Trends and Polices 2020", Chapter 2, <https://www.oecd-ilibrary.org/sites/f528d444-en/index.html?itemId=/content/component/f528d444-en>

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022
Milan, Italy

impacted by challenges such as unsustainable consumption and production, as well as poor management of natural resources and waste. Furthermore, numerous countries indicate that there are some external threats such as global economic instability, natural disasters, climate change, biodiversity loss, and regional and international security issues that threaten tourism's ability to drive sustainable development, as shown in figure 1.

Figure 1: Tourism share in the different 17 SDGs 2030



Source: Tourism for SDGs Website, 2022. <https://tourism4sdgs.org>

Econometric Model:

According to (Dimoska & Petrevska, 2012) sustainable tourism cannot be considered a special form of tourism. Instead, all segments and components of the tourism industry need to be sustainable; therefore, the authors argue that to develop sustainable tourism both the supply (tourism product suppliers) and the demand (tourism product users) need to be assessed.²⁹That's why we will be engaging tourism expenditure, tourist arrivals from one side which is

²⁹ Dimoska, T. & Petrevska, B. (2012). Indicators for Sustainable Tourism Development in Macedonia, Conference Proceedings, First International Conference on Business, Economics and Finance "From

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

reflecting the demand side of tourism and we will also engage No. of establishments, and No. of rooms available to represent the supply side of tourism.

To study the impact of digitalization on tourism sector, we choose tourism receipts to be the dependent variable that reflects tourism sector, as tourism sustainability is connected to the increase in number of tourist's arrivals and to tourism receipts, where one of the major goals of sustainability in tourism sector is to enhance tourism receipts, and we focused on secured internet servers to reflect the independent variable in order to measure the digitalization of a certain economy. We focused on the coefficient β_1 of the core independent variable (servers) to determine whether there is a significantly positive relationship between digitalization and tourism sustainability or not. According to Neagu, which is consistent with the theoretical model:

$$TRREC_{it} = \beta_0 + \beta_1(\text{Servers})_{it} + \beta_2 X_{it} + \epsilon_{it}, \quad (1)$$

where i represents the i -th country, t represents the t -th year, Tourism receipts (TRREC) is the dependent variable, servers are the core explanatory variable, and X represents the control variables arrivals, tourism expenditures, co2 emissions and No. of rooms.

In the light of the differences among different countries, we first constructed two cross sectional models, one is reflecting set of developed countries and another model that is reflecting the impact of digitalization on tourism sustainability on a set of developing countries.

To divide the countries into two sets, we used the data of the world bank, world development indicators (WDI) and according to the income level of the countries, there were two sets the first set is composed of the high income and middle upper income countries that included 73 different country but due to full data availability the analysis was made on 64 country only, and this set reflects the developed countries, while the other set was composed of the low income and low middle-income countries, that included 56 different country, but due to data availability there were only 39 country, to form the developing countries set. Year 2018 was chosen to conduct the analysis on, as it was the latest year with the updated variables.

Estimated Results and Discussions:

Basic Regression Results for Developed Country Cross Section Analysis:

Liberalization to Globalization: Challenges in the Changing World", 13-15 September, 2012, Stip, Macedonia, pp. 389-400.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

The set of data for this group of countries (developed countries) include 64 countries, with a dependent variable, tourism receipts, and the main independent variable is the number of secured internet servers that is reflecting digitalization and a number of other independent variables that includes the following:

Table 1: Description of used variables in the developed countries model

| Symbol Used | Used Variable | Source |
|-------------|--|---|
| TRREC | International tourism, receipts (current US\$) | World Development Indicator, World Bank |
| TOUREXP | International tourism, expenditures (current US\$) | World Development Indicator, World Bank |
| ARRIVALS | International tourism, number of arrivals | World Development Indicator, World Bank |
| GDPCAPGR | GDP per capita growth (annual %) | World Development Indicator, World Bank |
| CO2KT | CO2 emissions (kt) | World Development Indicator, World Bank |
| SERVERS | Secure Internet servers | World Development Indicator, World Bank |
| ROOMS | Number of available rooms for receiving tourists in this country | United Nations World Tourism Organization |

Source: World Development Indicators, World Bank, 2022

Table 2: Application of variables using EViews

Dependent Variable: TRREC

Method: Least Squares

Date: 24/1/22 Time: 17:10

Sample (adjusted): 73

Included observations: 64 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| C | 1.35E+09 | 1.46E+09 | 0.923265 | 0.3598 |
| TOUREXP | 0.350179 | 0.087931 | 3.9824 | 0.0002 |
| ARRIVALS | 123.5610 | 36.74070 | 3.363055 | 0.0014 |
| GDPCAPGR | 3.36E+08 | 4.31E+08 | 0.780666 | 0.4382 |
| CO2KT | -9794.965 | 5277.534 | -1.855974 | 0.0686 |
| SERVERS | 1701.201 | 1204.864 | 1.411945 | 0.1634 |
| ROOMS | 30855.01 | 5651.601 | 5.459516 | 0.0000 |

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

| | | | |
|--------------------|-----------|-----------------------|----------|
| R-squared | 0.953976 | Mean dependent var | 1.58E+10 |
| Adjusted R-squared | 0.949131 | S.D. dependent var | 3.27E+10 |
| S.E. of regression | 7.36E+09 | Akaike info criterion | 48.38074 |
| Sum squared resid | 3.09E+21 | Schwarz criterion | 48.61687 |
| Log likelihood | -1541.184 | Hannan-Quinn criter. | 48.47376 |
| F-statistic | 196.9131 | Durbin-Watson stat | 1.711108 |
| Prob(F-statistic) | 0.000000 | | |

Table 2: Linear Regression Model Applied by the researcher for set of developed countries using Eviews software.

The adjusted R-squared of the model is around 0.949. The estimates are robust to model specifications, as the set of the independent variables in the model explains about 95% of the changes that takes place in the international tourism receipts as the dependent variable; this means that the model is well fitted.

The results showed positive relationship between the number of secured internet servers that is used to reflect digitalization in the different countries and the tourism receipts that is used to reflect tourism in general and sustainable tourism in specific. In order to tackle sustainable tourism, there should be economic profitability side including maximizing the economic benefits of tourism to the local community, including the expenditure of tourists in the area, and regarding the environmental aspect, this includes two main sub objectives which are, effective waste management and clean environment.³⁰ These results match the findings of Al-(Mulali et al., 2020) as the research which shows that digital adoption has a positive impact on real tourism receipts for the sample groups, except high-income countries.³¹ (Tsaurai & Chimbo, 2019) find ICT has a positive influence on tourism receipts both in the long and short runs. This finding guides us to accept H1 which states that digitalization affects tourism sector in developed countries, and this contributes to sustainability, as the results also showed that there is an inverse relationship between co2 emission and tourism receipts, where co2 emissions reflect the environmental part.

The results also showed that there is a positive relationship between tourism receipts and the following independent variables, TOUREXP, ARRIVALS, GDPCAPGR, ROOMS with probabilities of error of 0.0002, 0.0014, 0.4382, 0.000 respectively.

Tourism expenditure refers to the total consumption expenditure made by a visitor, or on behalf of a visitor for goods and services during his/her trip and stay at the destination place (country). It also includes payments in advance or after the trip for services received during the trip, so

³⁰ Florek, Iwona. (2012). Sustainable Tourism Development. Region formation and development studies - Journal of Social Sciences. 157-166. 10.1007/3-540-25815-9_16.

³¹ Al-mulali, Usama & Solarin, Sakiru & Andargoli, Amir & Gholipour, Hassan. (2020). Digital adoption and its impact on tourism arrivals and receipts. Anatolia. 32. 1-3. 10.1080/13032917.2020.1856692.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

Milan, Italy

this reflects the positive relationship that was found between the two stated variables, as when tourism expenditure increase, this will automatically increase the tourism receipts.

Tourism arrivals and tourism receipts are positively and significantly associated with one another, according to (Steve et al., 2020), there is a positive relationship, and this matches our results.³²

Although the results showed that annual change in the GDP per capita is not statistically significant, but research conducted by (Rasool, 2021) has proofed that there is a bi-directional causality between inbound tourism represented by tourism receipts and GDP per capita, which directs the level of economic activity and tourism growth and mutually influences each other in that a high volume of tourism growth leads to a high level of economic development.³³

Regarding the No. of rooms variable that was used in the analysis, it was used to reflect tourism occupancy statistics in order to determine the capacity in tourist accommodation. According to Eurostat, the number of existing rooms is the number the establishment habitually has available to accommodate guests (overnight visitors), excluding rooms used by the employees working for the establishment. If a room is used as a permanent residence (for more than a year) it should not be included. The variable was statistically significant at probability of error 0.0000, which reflects a positive relationship between the stated variable and the number of tourism receipts.³⁴

Developing Country Cross Section Analysis:

$$TRREC_{it} = \beta_0 + \beta_1(\text{Servers})_{it} + \beta_2 X_{it} + \epsilon_{it}, \quad (2)$$

where i represents the i -th country, t represents the t -th year, Tourism receipts (TRREC) is the dependent variable, servers are the core explanatory variable, and X represents the control variables arrivals, tourism expenditures, co2 emissions (kg per 2017 PPP \$ of GDP) and No. of establishments.

The set of data for this group of countries (developing countries) include 39 countries, with a dependent variable, tourism receipts, and the main independent variable is the number of secured internet servers that is reflecting digitalization and a number of other independent variables that includes the following:

³² Steve Yaw Sarpong, Murad A. Bein, Bright Akwasi Gyamfi, Samuel Asumadu Sarkodie, 2020, "The impact of tourism arrivals, tourism receipts and renewable energy consumption on quality of life: A panel study of Southern African region", *Heliyon*, Volume 6, Issue 11.

³³ Rasool, H., Maqbool, S. & Tarique, M. The relationship between tourism and economic growth among BRICS countries: a panel cointegration analysis. *Futur Bus J* 7, 1 (2021). <https://doi.org/10.1186/s43093-020-00048-3>

³⁴ Eurostat Website, 2022, https://ec.europa.eu/eurostat/cache/metadata/en/tour_occ_esms.htm

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022
Milan, Italy

Table 3: Description of used variables in the developed countries model

| Symbol Used | Used Variable | Source |
|-------------|---|---|
| TRREC | International tourism, receipts (current US\$) | World Development Indicator, World Bank |
| TOUREXP | International tourism, expenditures (current US\$) | World Development Indicator, World Bank |
| ARRIVALS | International tourism, number of arrivals | World Development Indicator, World Bank |
| GDPCAPGR | GDP per capita growth (annual %) | World Development Indicator, World Bank |
| CO22017 | CO2 emissions (kg per 2017 PPP \$ of GDP) | World Development Indicator, World Bank |
| SERVERS | Secure Internet servers | World Development Indicator, World Bank |
| ESTAB | Number of available establishments for receiving tourists in this country | United Nations World Tourism Organization |

Source: World Development Indicators, World Bank, 2022

Table 4: Application of variables using EViews

Dependent Variable: TRREC

Method: Least Squares

Date: 24/1/22 Time: 15:58

Sample (adjusted): 56

Included observations: 39 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| C | 8.14E+08 | 6.65E+08 | 1.223241 | 0.2302 |
| ARRIVALS | 602.5928 | 113.8968 | 5.290693 | 0.0000 |
| TOUREXP | 0.535626 | 0.160148 | 3.344568 | 0.0021 |
| GDPCAPGR | 40742911 | 1.36E+08 | 0.300108 | 0.7660 |
| CO22017 | -7.99E+09 | 2.99E+09 | -2.672706 | 0.0117 |

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING

18-20 February 2022

Milan, Italy

| | | | | |
|--------------------|-----------|-----------------------|-----------|----------|
| SERVERS | -17070.04 | 6847.093 | -2.493035 | 0.0180 |
| ESTAB | 109722.2 | 36606.49 | 2.997343 | 0.0052 |
| R-squared | 0.913606 | Mean dependent var | | 3.13E+09 |
| Adjusted R-squared | 0.897407 | S.D. dependent var | | 5.91E+09 |
| S.E. of regression | 1.89E+09 | Akaike info criterion | | 45.72150 |
| Sum squared resid | 1.15E+20 | Schwarz criterion | | 46.02009 |
| Log likelihood | -884.5692 | Hannan-Quinn criter. | | 45.82863 |
| F-statistic | 56.39904 | Durbin-Watson stat | | 2.009227 |
| Prob(F-statistic) | 0.000000 | | | |

Table 4: Linear Regression Model Applied by the researcher for set of developing countries using E-views.

Similarly, to the previous model conducted on the developed countries, we used the same variables except for co2KT, we used CO2 emissions (kg per 2017 PPP \$ of GDP) instead, and when it comes to the number of rooms available to tourists that was used in the previous model, we used instead the number of establishments for reflecting better statistical data.

The adjusted R-squared of the model is around 0.897. The estimates are robust to model specifications, as the set of the independent variables in the model explains about 90% of the changes that takes place in the international tourism receipts as the dependent variable; this means that the model is well fitted.

The results showed negative relationship between the number of secured internet servers that is used to reflect digitalization in the different countries and the tourism receipts that is used to reflect tourism in general and sustainable tourism in specific. It is statistically significant but showing an inverse relation. These results match (Tsokota, 2019), that showed that ICT can negatively impact tourism, and thus, countries intending to lure visitors to their tourism destinations should avoid policies, events and activities that can result in bad publicity in the international media in case of Zimbabwe.³⁵ These findings lead us to the decision of rejecting H2 that states that digitalization has positive impact on tourism in the developing countries and this contributes to sustainability.

The results also showed that there is a positive relationship between tourism receipts and the following independent variables, TOUREXP, ARRIVALS, GDPCAPGR, ESTAB with probabilities of error 0.0021, 0.000, 0.7760 and 0.0052 respectively.

³⁵ Tsokota, T., (2019), "The reticent effect of ICT on tourism: A case study of Zimbabwe", African Journal of Hospitality, Tourism and Leisure, Volume 8 (3) - (2019) ISSN: 2223-814X.

2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

Milan, Italy

The results also showed that there is an inverse relationship between co2 emission and tourism receipts, where co2 emission is reflecting the environmental part in tourism sustainability.

Conclusion:

This research was mainly conducted to study the impact of digitalization on tourism sustainability, and to compare the findings between the developing and developed countries. The set of data for the first group of countries included 64 developed countries, with tourism receipts reflecting the dependent variable, and the main independent variable is the number of secured internet servers that is used in reflecting digitalization

The results showed positive relationship between the number of secured internet servers that is used to reflect digitalization in the different countries and the tourism receipts that is used to reflect tourism in general and sustainable tourism in specific. This finding guides us to accept H1 which states that digitalization affects tourism sector in developed countries, and this contributes to sustainability.

The other set of data included group of 39 developing countries, with tourism receipts reflecting the dependent variable, and the number of secured internet servers as the main independent variable which is reflecting digitalization and a number of other independent variables. The results showed negative relationship between the number of secured internet servers that is used to reflect digitalization in the different countries and the tourism receipts that is used to reflect tourism in general and sustainable tourism in specific. These findings lead us to the decision of rejecting H2 that states that digitalization has positive impact on tourism in the developing countries and this contributes to sustainability.

So, we have found that digitalization has positive impact on tourism in developed countries which will positively affect sustainability, and negative impact on tourism when it comes to developing countries which will adversely affect sustainability.

Regarding Co2 emission the results showed that there is an inverse relationship between Co2 emission and tourism receipts, where the higher the co2 emission the lower tourism receipts is and vice versa in both sets of data reflecting developing and developed countries.

For better research, we recommend conducting inbound tourism survey in an annual report of each country or for group of countries that will ease the measuring process. We also recommend the construction of an index that reflects tourism sustainability for all countries across the globe that reflects all dimensions of sustainability in the tourism sector, so that tourism sustainability could be measured easily.

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2nd International Conference on Advanced Research in MANAGEMENT, ECONOMICS AND ACCOUNTING



18-20 February 2022

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