TOURISM 4.0: DATA-DRIVEN COVID-19 RECOVERY

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Abstract: the COVID-19 pandemic is causing substantial economic consequences, especially in the tourism sector. Stakeholders of all levels are involved in the process of mitigating the crisis and finding recovery solutions. Previous research has pointed to the irreplaceable importance of ICT in tourism, emphasizing the post-COVID period's benefits. This paper presents the possibility of applying Big Data analytics during the recovery, bearing in mind that this type of data is becoming more relevant than ever in the tourism sector. The paper includes an exceptionally successful example of Big Data analytics in Korea - Asian Development Bank and Korea Telecom dashboard - Travel Intelligence Platform (TrIP). Based on LTE (Long-Term Evolution) data, they can estimate tourist's migration, both domestic and foreign.

Keywords: *COVID-19, Tourism 4.0, Big Data, ICT in tourism*

Introduction

The global tourism sector has seen remarkable economic results since the COVID-19 crisis. According to WTTC (2021), in 2019, tourism contribution to the world's GDP was USD 9.1 trillion, accounting for 10.3% of GDP. It generated 334 million jobs (1 in 10 jobs around the world), 1.7 trillion USD visitor exports (6.8% of total exports and 28.3% of global services exports) and 948 billion USD capital investment (4.3% of total investment). However, the outbreak of the pandemic has caused unprecedented consequences. The share of the tourism sector in global 2020 GDP decreased by 49.1%, compared to 2019, while the number of employees decreased by 18.5% (Ibid). Fotiadis et al. (2021) show that the drop in tourist arrivals can range between 30.8% and 76.3% and persist until June 2021. The sector of small and medium enterprises was particularly affected. Approximately 85% of enterprises recorded a decline in activity (Beraha & Đuričin, 2020), not only in tourism but also in supporting sectors. Particularly problematic is that more than a year after the pandemic declared, there are no reliable projections of the impact's final extent.

Although tourism has always shown a high degree of flexibility and has been developed through adaptation to global trends, local market conditions and consumer needs, reduced traffic and personal contact, recovery is highly uncertain. Despite that, specific measures and activities are already being applied to accelerate it. Assaf & Scuderi (2020) have pointed out the most practical ones, such as hygiene and cleaning procedures and protocols, modifications in direct communication, i.e.

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counter shields, reduction of occupancy, and similar. Authors also emphasize that "in the long term, automation technologies, robots and artificial intelligence may help facilities to decrease their fixed costs, improve liquidity and resilience and help to maintain social distance." In general, information and communication technology has a crucial role in this process.

This paper aims to point out the impact of technological changes on tourism, primarily through Big Data use to improve decision-making to overcome the consequences of travel restrictions and social distancing due to the Covid-19 pandemic.
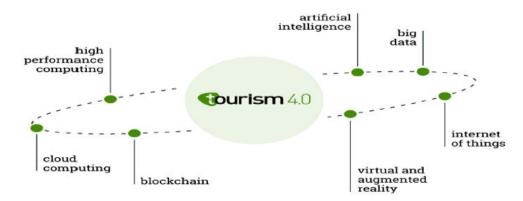
Tourism 4.0 - The digital transformation of tourism

The twenty-first century has brought significant changes by applying advanced, sophisticated technological solutions, which has led to the global transformation of society and the economy. Progress has led to the emergence of the Fourth Industrial Revolution and the concept of "Industry 4.0", which encompasses the application of ICT in industrial processes and products (Zupan Korže, 2019). Even though Industry 4.0 covers a wide range of concept (Lasi et al., 2014), it "*defines a methodology to generate a transformation from machine dominant manufacturing to digital*" (Oztemel & Gursev, 2018). Thanks to the application of technology such as the Internet of Things, Big Data, Blockchain, Machine-to-Machine (M2M) technology, Artificial Intelligence, Virtual Reality and Augmented Reality, it is possible to connect human resources, machines and objects, as well as information technologies horizontally and vertically, thus achieving dynamic management of complex business and production processes (Starc Peceny et al., 2019). With a high degree of flexibility, this concept can overcome modern challenges that include global competition, an unstable market, shifting the product life cycle, including crisis like COVID-19 pandemics.

Tourism is a technology-dependent industry because technology permeates all tourism market factors, including supply, demand, intermediaries, and the tourism experience. However, to consider the tourism industry smart, it needs to experience a comprehensive digital transformation. The process involves the use of digital technologies to innovate business processes and thus become more efficient or effective, presented in Figure 1. The central premise is not technology use for replicating existing services in digital form, but to transform that service into something significantly better - to evolve it and make it more efficient and easier to use. Smart Tourism or Tourism 4.0 has three main components, Smart Destination – a tourism destination where advanced technology is embedded into processes and infrastructure; Smart Experience – with possibilities for tourists to be creators of its

own experience and Smart Business – which enables solid cooperation between all stakeholders, based on digitalization and Big Data technology (Urbančič et al., 2020).

Figure 1. Key enabling technologies with the potential for use in the tourism sector

Source: Urbančič et al., (2020), p. 238.
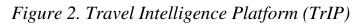
Big data in the analysis of tourist trends

Tourism 4.0 relies heavily on a variety of data to create a tailor-made personalized travel experience. Previous research in tourism has been mainly focused on guest satisfaction and the business performance of stakeholders. The standard instruments used for data collection were questionnaires and interviews, so in many cases, the results were biased due to a lack of representative samples (Joseph & Varghese, 2019). However, the emergence of new technologies provides the ability to collect and process much larger amounts of data in different formats. Data can be collected from tourists directly (online reviews on Airbnb, Booking. com or else, sentiment opinions like feedback in traveller's or influencer's blogs, photos on Instagram or similar social networks), web browser's search history, online booking and purchasing, but also data from sensors like RFID and spatial-temporal data, like GPS data, mobile data (both national and roaming), Bluetooth data, wi-fi data, weather data. Generally, all sources can be divide into three main groups: data generated by devices, transaction data generated by operations and content generated by users (Iorio et al., 2019). Also, Open Data from various sources, such as weather conditions, extend the possibilities. Based on data volume, variety and velocity, it can be considered as Big Data.
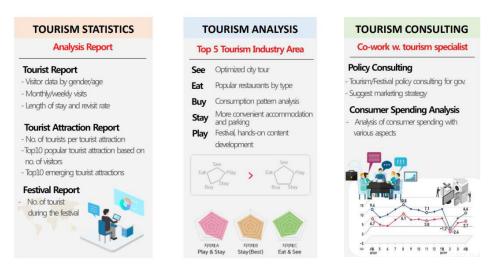
Big Data analysis in tourism adds unique value to stakeholders, which they cannot extract from standard data. Precisely due to its size and often lack of structure, it is possible to gain unique and valuable insights into tourists' preferences, behaviour, practices, and attitudes. It can also enhance tourism policies, particularly in pandemic recovery, creating a shift from marketing to the holistic approach to tourism. With accurate data sets and analysis, proper Big Data analytical methods can be employed within the framework of Tourism 4.0.

One of the first empirical studies is conducted by Gallego & Font (2020). Authors develop a methodology for the early recognition of tourist markets recovery from COVID-19, based on Skyscanner data on air passenger searches and picks for flights between November 2018 and December 2020, through ForwardKeys. He et al. (2020) create an index of COVID-19 impact on Chinese industries, including tourism, based on Shanghai Stock Exchange and Shenzhen Stock Exchange data. Keeping in mind the possibilities of Big Data analytics in tourism, we can expect more studies in the near future.

Best praxis - Asian Development Bank and Korea Telecom cooperation

In most cases, the public sector lag behind the private sector in using big data for tourism management, but cooperation between Asian Development Bank and Korea Telecom offers a good case. Intending to provide faster recovery, they develop a model to understand the impact of the COVID-19 crisis on tourism in Korea, based on their previous research on the possibilities of applying Big Data analysis in the touristic sector to improve public policies.

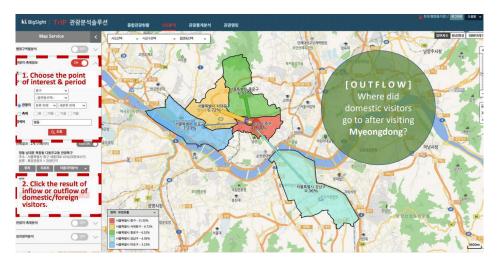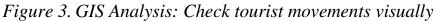*Figure 2. Travel Intelligence Platform (TrIP)*

Source: Cho (2021)

For this research, Korea Telecom provided LTE (Long-Term Evolution) data representing tracking signals between mobile devices and base stations. Their model shows the possibility to estimate the changes in the tourist's movements in a five-minute frequency. To form reliable conclusions, it was also necessary to establish clear criteria for distinguishing data on the circulation of tourists and the domestic population. A special distinction has been made between data on foreign tourists based on roaming.

Korea Telecom has also created the primary analytical tool - a big data analytics dashboard Travel Intelligence Platform (TrIP), to compare the tourism competitiveness of destination (areas) in the country (Figure 2). The dashboard has

the ability to monitor the number of visitors, their movements, classified by category, and rank destinations according to set criteria (Figure 3). It can identify domestic and foreign tourists, and for domestic tourists, it can create a demographic profile based on gender, age and origin. The system can is 95% accurate for domestic and 75% for foreign tourists.

Figure 3. GIS Analysis: Check tourist movements visually

Source: Cho (2021)

According to expectations, the results indicate a negative correlation between population movements and the number of infected in certain areas. It was also noticed that the frequency of travel increased during the holidays, but locally. Seoul has suffered the most significant consequences.

Conclusion

Despite the fact that the COVID-19 pandemic has caused unforeseeable consequences for tourism, it can be seen as a chance for medium and long-term improvement, primarily through implementing ICT solutions at all levels and the expansion of the concept of Tourism 4.0. The use of Big Data in the analysis of tourist trends enables a better understanding of the pandemic's impact on tourist flows. The results can be used at all levels, from the business sector to evidence-based policymakers.

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