

# Artificial Intelligence and the Development of Smart Tourism

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## Abstract

*The main intention of this manuscript is to fill this gap by evaluating the impacts of artificial intelligence on the development of smart tourism. The study will start with discussing previous literature on smart tourism and contributions of artificial intelligence on the development of tourism based on earlier academic findings and practical implications. For methodology, the paper will follow literature review as a guideline and the findings will be critically evaluated. Besides that, the study will suggest a model whereby the impact of artificial intelligence on smart tourism will be quantitatively analyzed. In the suggested model, related economic, technological, social and environmental variables including total revenue created by smart tourism using artificial intelligence, contributions of technological improvement, the degree of social inclusion to tourism activities for disadvantaged individuals (such as elderly, people with disabilities, pregnant women etc.) with respect to the artificial intelligence applications, and the degree of environmental degradation parallel to the shift to smart tourism.*

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*In conclusion, the paper will argue that the presence of artificial intelligence has created a new opportunity for tourism where economic, social and environmental benefits can be obtained, therefore local and regional governments should promote the applications regarding to artificial intelligence as well as encouraging national and international stakeholders to invest in artificial intelligence induced smart tourism sector. All in all, the future of world are in the hands of current political and economic decisions; hence a focus on artificial intelligence in tourism may provide everlasting benefits not only for those who engage in tourism activity as tourists, but it is also capable of increasing the life quality of service providers and tourism investors by providing them an opportunity for a sustainable economic revenue within a healthier environment.*

### **Introduction**

Development of technology has led to improvements in various areas, enabled the emergence of new economic sectors and increased the efficiency of existing ones. Similar to mechanization of factories and increased output of production, service sector has gained acceleration to a great extent parallel to the availability of technological applications. As an important service sector, tourism also benefit from technological development. Although in the previous literature of tourism, artificial intelligence is mainly used to estimate tourist arrivals and forecasting the economic development in the future (Claveria & Torra, 2014; Stalidis et. al., 2015; Asadi et. al., 2016), currently the focus has shifted to technological applications in tourism and new sectors in tourism such as smart tourism.

Smart tourism is defined as a new social, cultural and economic activity where people move to other countries and places outside of their daily environment for a personal or professional aim (UNTWO, 2015). Started as a part of smart city applications, smart tourism has rapidly become an important economic activity that is capable of promoting local development and other industries in the region (Ren, 2013). The activity of smart tourism is connected to technological infrastructure, promotion of wifi, development of mobile applications, a new understanding of management as well as taking a new attitude for data collection and analysis (Gretzel et. al., 2015). The name “smart” and “intelligence” was used interchangeably in the previous literature, denoting the same meaning that consists of wide use of technological entities despite essential differences between the terms of smart tourism and intelligence tourism (Li et. al., 2017). The activity itself does not have a long past, however it has been growing in various parts of world especially after 2011 (Zhu, Zhang & Li, 2014). Parallel to the development of intelligence tourism guide system and new generation web-based systems, availability of smart tourism increased via mobile devices such as smart phones, tablets and other technological instruments (Goy & Magro, 2004; Owaied et. al., 2011).

The application of artificial intelligence in smart tourism has numerous benefits. First of all, smart tourism creates a new opportunity for employment and investment in an economic sense, along with enabling the development of side sectors such as accommodation, transportation, industry and so on. In addition to economic benefits, smart tourism with artificial intelligence can enhance the involvement of disadvantaged people. For instance, guidelines or gadgets designed for old people as well as provision of special assistance for those who would need such as people with disabilities or pregnant women can be ensured by technological services based on artificial intelligence. Finally, the artificial intelligence technology can transform tourism activity in an environmentally sustainable manner where water, land and air pollution may be reduced and the damage on environment can be erased.

Although there have been various studies in the previous literature, there has been no study found regarding to impact of artificial intelligence in smart tourism with a quantitatively analyzable form. In the next section, the four main determinants of the smart tourism will be briefly discussed, and then they will be presented in a suggested model.

#### **Four determinants of smart tourism**

In this section, the four determinants of artificial intelligence in smart tourism, namely the economic, technological, social and environmental impacts will be discussed.

##### **Economic aspects**

Starting with the economic gains, the contributions of artificial intelligence in smart tourism can be measured through the extra economic value that it creates as it enables technologies supporting new types of collaboration and value creation leading to innovation, entrepreneurship and competitiveness (Gretzel et. al., 2015). Smart transformation of touristic facilities eventually increases their competitiveness in the tourism market as they facilitate accommodation, transportation, and other-tourism related services. This improvement in the tourism services has a direct reflection on tourism revenues by contributing to the profits of stakeholders. The main intention of smart tourism is to acquire a new work environment where the efficiency of available service facilities increases and the cost of providing a service with a high maintenance decreases. The reliance of technological improvements with high efficiency rather than traditional practices contribute to financial well-being of stakeholders as they require less use of energy, less natural or human resources. In short, there is a positive relationship between the use of artificial intelligence in smart tourism and the revenues received by tourism stakeholders.

### Technological aspects

Furthermore, the use of artificial intelligence in smart tourism design may further increase the advancement of technology. In the beginning, individuals may develop bias towards the presence of artificial intelligence systems, such as robots. Despite the rapid development of technology, the time needed by users to adapt technological devices properly takes some time. This is because people have long been exposed to traditional services, and they are most of the time looking for their human equivalent when they would like to benefit from a service. Compared to health-related services, the degree of such negative biases is small, yet an initial response for artificial intelligence applications in tourism may be limited to some extent. On the other hand, the artificial intelligence systems will become an integral part of the life as people become more and more exposed to these services. Smart tourism allows a design of facilities that can integrate further technological advancements in the future. Besides that, technological improvements are subject to time such that technology develops exponentially over time. In other terms, technological progress has acceleration for doubling itself, as the phenomenon is known as Moore's Law, named after the work of Gordon Moore (1965) on integrated circuits.

### Social aspects

Third, advancements in artificial intelligence applications in smart tourism activity encourage the participation of disadvantaged groups in social life. For example, people with physical disabilities, elderly individuals, pregnant women etc. may require special assistance for movement in a facility and smart design of tourism facilities respond such demands with smart solutions including the use of robotics, moveable instruments, elevators, and so on. The main problem behind the social exclusion is that the individuals with disadvantages have no means to access social life, and they are generally isolated in the absence of social support. The introduction of artificial intelligence has therefore a great importance, as technology can replace the need for human power for caring these disadvantaged people to maximize their welfare they derive from these leisure time activities, and most importantly, provide them the means to be a part of a society. Hence, there is a positive relationship between the presence of artificial intelligence in smart tourism and the degree of social inclusion for people with disadvantages.

### Environmental aspects

The cloud-based infrastructure of a "smart destination" generally promotes the emergence of well-developed mobile tourism applications by tourism stakeholders with lesser reliance on natural resources (Lamsfus et. al., 2015). When the information regarding to tourist arrival, accommodation, weather conditions in a destination, etc. can be delivered by using mobile devices and programs, the physical energy that

would have been spent otherwise, will be saved. Reducing the burden on environment is also highly relevant to the transportation. Ride sharing services such as BlaBla Car or Uber provide an eco-friendly solution for the congestion. Moreover, mobile apps that allow users to locate and use a bike nearby have become very popular in European cities as well as in many tourism destinations.

One of the fundamental aspects of smart tourism is therefore decreasing the use of materials which previously dominate the tourism service with respect to industrial production, however, the new understanding of tourism service refers to economize the natural resource consumption and relying on alternative sources and methods. As the burden on natural resources is successfully replaced by smart technologies which enable the same or better services with less environmental damage, the tourism activity will become more environmentally sustainable. It should be also noted that, the regeneration of environment is subject to time, and the degree of regeneration will increase exponentially as time passes.

### Suggested Model

Based on the discussion in the previous section, the model can be considered as the following:

$$(1) \text{ AI} = \beta_0 + \beta_1 \cdot \text{TR} + \beta_2 \cdot \text{TD}^t + \beta_3 \cdot \text{SI} + \beta_4 \cdot \text{ER}^t + \varepsilon$$

$$t \geq 0, t = Z^+ : \{1, 2, 3, \dots\}$$

where,

AI implies the *impact of Artificial Intelligence*

TR implies *Total Revenues* created by smart tourism using artificial intelligence

TD implies *Technological Development* contributions

SI implies the degree of *Social Inclusion* to tourism activities for disadvantaged individuals

ER implies the degree of *Environmental Regeneration*

t implies *Time*

$\beta_0, \beta_1, \beta_2, \beta_3$  and  $\beta_4$  imply coefficients, and

$\varepsilon$  implies residual (i.e. the effect of other variables).

In general, the impact of artificial intelligence on smart tourism can be evaluated by four main variables, namely total revenues created by smart tourism using artificial intelligence, contributions of technological development, the degree of social inclusion to tourism activities for disadvantaged individuals, and the degree of environmental degradation. Besides that, there might be other variables that can explain the variance in the effect of artificial intelligence in smart tourism which the

model did not capture. For example, satisfaction of tourists in a particular tourism destination as well as an increase in the life quality of local service providers can be important contributors for measuring the impact. For that reason, a residual is provided in the model which implies the variance that cannot be explained by four main variables.

This model is appropriate for any kind of numerical data since the aim of the suggested model is to provide a tool for the measurement of the effect of artificial intelligence on smart tourism in a quantitative form. Moreover, the research enables the measurement of the impact through statistical analysis by modeling the four main variables in a mathematical framework instead of focusing on subjective methods that may diminish the reliability and objectivity of the findings.

### **Concluding remarks**

In conclusion, the use of artificial intelligence in smart tourism has various benefits for people as well as for the environment. As discussed previously in this paper, the artificial intelligence systems are capable of increasing the total revenue derived by tourism stakeholders, contributing to further developments in technology as people get to know these services and they acknowledge the importance of technological devices for facilitating their lives, increasing the degree of social inclusion in the society by providing a means for disadvantaged people to socialize and also boosting the environmental regeneration by decreasing the burden on environment. In this study, these benefits have been expressed into a mathematical model.

Taking these benefits into consideration, artificial intelligence practices needs to be increased as a form of smart tourism. However, the adaptation of users can be slower compared to rapid development of technology, as argued above. In order to establish and spread the artificial intelligence technology through smart tourism, governments need to collaborate with tourism stakeholders, promote smart tourism applications to increase economic competitiveness and reduce social and environmental costs. Moreover, the number of courses given to children regarding to technological adaptation in schools should be increased. Generations should not only learn how to adapt new technology, but they also need to “think” by the means of technology, by offering creative and smart solutions for the problems that they face in their daily lives. All in all, being “smart” is not only restricted to the business sphere, but rather it is a way of living and philosophy of life, that increases the well-being of individuals along with providing economic, social and environmental benefits, with only small changes.

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