

Facilitating Smart Tourism Destination Development: Towards a Model of Information System for Smart Tourism

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Abstract. *With the intensive development of ICT and rapidly growing outbound tourism markets, the concept of smart tourism has been mentioned increasingly over the past several years. However, this concept is still not well grounded in theory, which makes it difficult to comprehend and even more complicated to implement in practice. To better understand the concept and provide tangible mechanisms for implementing it, this paper addresses some of its key aspects and provides a theoretical framework and guidelines for the development of a general model of information system that would serve the development and management of a smart tourism destination.*

Keywords. Smart tourism, Smart tourism destination, Information system.

1 Introduction

It is unquestionable that the development of new information and communication technologies over the last 50 years has had a strong impact on leisure travel. With the development of the first computer reservation systems in the 1970s, and especially with the development of the Internet, modern ICTs were slowly becoming an integral part of each phase of the leisure travel cycle (Buhalis & Law, 2008, p. 609-610.). However, with the intensive development of mobile technologies in the 21st century, tourism is experiencing an unprecedented growth on a global scale. Namely, according to UNWTO statistics, from 1995 to 2019 and the outbreak of the SARS-CoV-2 coronavirus pandemic that brought the travel industry to a halt, the number of leisure travels in the world increased by more than 250% on an annual basis (UNWTO, 2019).

Some of the key roles of ICT in the context of leisure travel are providing fast and easy access to information regardless of the location and increasing the level of interactivity among all stakeholders in

tourism. In addition, with respect to the aforementioned coronavirus pandemic, smart ICT solutions should play a vital role in reviving business processes once tourism enters recovery phase, especially in understanding the new patterns caused by the pandemic itself (Thong et al., 2022).

Tourism represents a very complex phenomenon, which is evident from one of the commonly used definitions of tourism set by AIEST in 1981, describing it as: "... the sum of the phenomena and relationships arising from the travel ..." (Vanhove, 2012, p. 2). A massive increase in the number of travels resulted in some very negative consequences for many popular destinations. One of the most serious problems caused by this increase is overtourism, affecting mostly big urban destinations and often resulting in degradation of public spaces and cultural heritage, creation of monofunctional spaces, pollution caused by tourism, decline in local values and customs, conflicts between residents and tourists, rising prices and cost of living and over dependence on tourism (Nunkoo & Ramkissoon, 2010, p. 41-42). Most of these consequences are the result of poor destination management, most often caused by lack of knowledge, expertise and motivation among entities in charge of tourist destination development and management, but also lack of information about visitors and resources in the destination. Due to these and similar problems caused by the large increase in the number of travels, the future of tourism has been increasingly considered in the context of sustainable tourism development, enabled by sustainable and smart solutions. Sustainable tourism development can be defined as: "...the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (WCED, 1987, p. 43). The tools that can support such a development are smart technological solutions and innovations fueled by modern ICT, aimed at better information and resources management in order to increase the attractiveness and competitiveness of tourist

destinations. This is the context in which the phrase "smart tourism" has been increasingly mentioned over the last 15 years, as a reflection of the impact of technology on tourism. The use of modern technologies in the context of smart tourism destinations presupposes the networking of all stakeholders, which is usually realized through sensorization and the use of big data, as well as new ways of connecting and exchanging information (such as social media, Internet of Things, Near Field Communication, Radio Frequency Identification, etc.) (Gretzel et al., 2015a).

2 Smart Tourism Destinations

Although the basic idea on which smart tourism is based is relatively simple and solid, the very concept of smart tourism remains poorly grounded in theory and practice. This is evident from the rather small number of scientific papers addressing this concept. Some authors put special emphasis on the use of technology, while others are more focused on destination management, but all of them emphasize the use of (big) data, advanced technologies and smart systems as a *condicio sine qua non* when it comes to smart tourism. Many authors argue that papers on smart tourism still lack conceptual and empirical development and that researchers have not fully analyzed how destinations apply this concept, what initiatives are being implemented and what are the results of these initiatives.

According to Gretzel et al., smart tourism can be defined as: "...tourism supported by integrated efforts at a destination to collect and aggregate/harness data derived from physical infrastructure, social connections, government/organizational sources and human bodies/minds in combination with the use of advanced technologies to transform that data into on-site experiences and business value-propositions with a clear focus on efficiency, sustainability and experience enrichment" (Gretzel et al., 2015b, p. 181). This definition clearly emphasizes the importance of technologies, but brings to the fore data and how they are used. Also, Gretzel et al. state that smart tourism consists of three basic components: smart tourism destinations, smart business ecosystem and smart tourism experience, and that all of them reside on smart data collection, processing, and exchange (Gretzel et al., 2015b, p. 180.).

Smart tourism destination can be considered the most important component, as it represents a fundamental precondition for the development of other components. There are numerous definitions of a smart tourism destination, one of which was offered by López de Ávila Muñoz et al. in a report entitled "Smart Destinations Report: building the future" prepared by SEGITTUR (Spanish: Sociedad Estatal para la Gestión de la Innovación y las Tecnologías Turísticas), a state-owned company for tourism

innovation and technologies management, defining a smart tourism destination as: "...an innovative tourist destination, built on an infrastructure of state-of-the-art technology guaranteeing the sustainable development of tourist areas, accessible to everyone, which facilitates the visitor's interaction with and integration into his or her surroundings, increases the quality of the experience at the destination, and improves residents' quality of life." (López de Ávila Muñoz et al., 2015, p. 32). The authors of this definition point out that the creation of smart tourism destinations requires the development of a strategic plan that considers the specifics of the destinations. Therefore, such a strategic plan requires an individualized approach for each destination and cannot be generalized, but there are still a number of general measures that such a plan should encompass, emphasizing in particular the encouragement of public-private partnerships, defining goals aimed at improving expected results, promoting innovations in business models, intensifying the use of advanced ICTs and implementation of systems for data collection and analysis and information distribution (i.e. communication) among all tourist destination stakeholders. (López de Ávila Muñoz et al., 2015)

This paper focuses on smart systems for data collection and analysis, as well as communication and distribution of information among all destination stakeholders. Given that a review of recent literature in the field of smart tourism shows that there are no scientific papers or related research approaching the analysis or implementation of such systems in a systematic and comprehensive manner, this paper proposes a framework for a general model of information system to support the development and management of smart tourism destinations.

3 Information Systems

Information systems are a complex combination of technology and human activity and, as such, can be defined in several ways. For example, one definition of information systems states that they represent "...a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization" (Laudon, Laudon, & Elragal, 2012). In general, it could be argued that their primary purpose is to help people working with data in order to improve a particular collective work activity (Korpela et al., 2004). Olivé points out three main functions of the information system: memory function, informative function and active function. In other words, an information system records general system state representations, provides information about the system state and supports performing actions that change its state (Olivé, 2007, p. 2).

Many authors think of information systems as socio-technological systems. For instance, Watson

defines an information system as a socio-technological system consisting of a social and technological subsystem, where the technological subsystem includes the technological and process component, and the social subsystem includes the structural and human component. The technological component mainly refers to information technology used to collect, process, store and distribute data, while the process component refers to a set of steps/actions taken when performing a particular business or organizational activity. On the other hand, the social subsystem consists of human and structural components, where the human component includes all individuals directly related to the system and all their skills, interests, attitudes, prejudices, and the like, while the structural component refers to organizational structure, i.e., to the relations between individuals within the organization. (Watson, 2007)

Given this concept, the information system in this paper is also viewed primarily as a socio-technological system, so for the purpose of modeling the information system, a theoretical framework called Cultural-Historical Activity Theory was used. The Cultural-Historical Activity Theory (shorter: Activity Theory) serves as a framework to better describe and understand the structure, development and the context of human activity (Engeström, 2009). Activity theory has been used repeatedly in various research related to information system development, as it provides a well-built framework for analyzing the complex dynamic settings of the systems under study, which typically involve interaction with technical and human elements (Ditsa, 2003). One of the main advantages of using Activity Theory in information systems research is that it fuses technology (i.e. tools) and context into a unit of analysis, which is - activity. To be more specific, neither society nor technology is put in the foreground, but rather the activity, which is viewed from a socio-technological perspective. (Allen et al., 2013)

4 Methodology

The specific method that was used for the purposes of this paper is called the *Activity-Oriented Development Method* (abbr. AODM). It is a method based on the Activity Theory. The author of this method, Daisy Mwanza, designed AODM as a practical methodological framework to support system design processes from the perspective of Activity Theory. The method consists of four methodological tools: Eight-Step-Model, Activity Notation, Technique of Generating Research Questions and Technique of Mapping Operational Processes. The main purpose of AODM is facilitating data collection and analysis, as well as the transfer of acquired knowledge. The mentioned methodological tools can be used iteratively, through six phases of research:

1.Examining and interpreting activity systems in the context of activity theory, 2.Developing a general model of activity system, 3.Disassembling systems into components, 4.Generating research questions, 5.Conducting detailed testing of all system components, 6.Interpreting and communicating the obtained results. (Mwanza, 2002)

All of the abovementioned tools are motivated by Engeström's general model of Activity Theory, which describes the activity system as an object-oriented interaction between objects and subjects performing the activities and actions, communities involved and the division of work within them, and tools and rules applied in the transformation process, which all together direct the activity system towards the desired outcome. (Engeström, 1999)

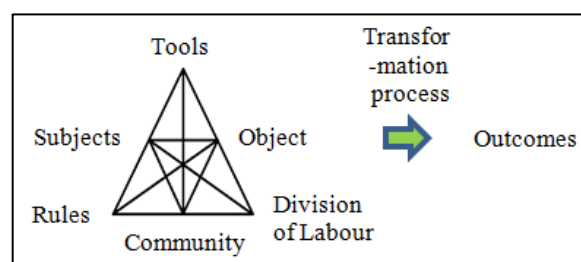


Figure 1. Activity Triangle Model (Engeström, 1987)

Specifically, the following objectives were derived using the AODM framework:

- To determine the different dimensions of a smart tourism destination and the possible indicators of their development (*Objects/Outcomes*).
- To describe communities involved in the development and management of smart tourism destinations and the division of labor within these communities in the context of smart tourism destination development (*Communities/Division of Labour*).
- To depict the important entities in the context of the development and management of a smart tourism destination, and the associated activities and actions (*Subjects/Division of Labour*).
- To identify rules and norms that affect the process of developing and managing a smart tourism destination (*Rules*).
- To identify tools (both material and abstract) which are used to carry out activities aimed at the development of smart tourism destinations, as well as their characteristics (*Tools*).
- To describe the central activity system of a smart tourism destination.

In order to meet all of the aforementioned objectives, an extensive literature review was conducted and the findings are described in the following section.

5 Findings

When it comes to determining the dimensions of a smart tourism destination, some of the related research has already considered possible ways of decomposing such complex ecosystems into simpler meaningful components (i.e. dimensions). In the year 2000, one of the most cited authors in the field, Dimitrios Buhalis, analyzed the components in the development of tourism destinations in general, and defined six dimensions that could describe successful tourism destinations. His framework was called the 6A, as it consisted of the following six dimensions: Attractions, Accessibility, Amenities, Available packages, Activities and Ancillary services (Buhalis, 2000, p. 98). In 2017, Tran, Huertas and Moreno expanded the 6A framework by adding smart components to all six dimensions, and they called it the (SA)6 framework. In addition to that, they also suggested a total of 57 indicators, divided into several subcategories, each of them assigned to a specific dimension. Namely, the dimensions they suggested were: Smart attractions (4 subcategories, a total of 7 indicators), Smart accessibility (3 subcategories, a total of 20 indicators), Smart amenities (3 subcategories, a total of 7 indicators), Smart ancillary services (8 subcategories, a total of 12 indicators), Smart activities (3 subcategories, a total of 5 indicators) and Smart packages (5 subcategories, a total of 6 indicators) (Tran, Huertas, & Moreno, 2017). In their later work, Tran, Huertas and Moreno further expanded their framework by assigning plausible scales and weights to all of the indicators, making their framework more robust and applicable in real life (Tran, Huertas, & Moreno, 2019). Since all other models and frameworks suggested by different authors seem to be more abstract and less studious when compared to the (SA)6, this framework could serve as a good starting point in building an information system to service the development and management of different dimensions of a smart tourism destination.

The second objective was to describe communities involved in the development and management of smart tourism destinations and the division of labor within these communities in the context of smart tourism destination development. There are several ways in which communities, or different groups of stakeholders in tourism can be differentiated and categorized. For example, a number of authors have divided stakeholders into primary and secondary, with primary stakeholders defined as those who have some sort of a formal relationship with the destination and are vital in its functioning, and secondary are those that affect (or are affected by) the destination, but do not have to be formally related to it and are not necessary for its survival (Sheehan & Ritchie, 2005). In order to better describe our activity system, we will use the categorization of stakeholders proposed by Miller and Twining-Ward, who divided tourism

stakeholders into four significant groups: Public sector (e.g. local authorities, regional authorities, various levels of government responsible for tourism and its key assets, destination marketing/management organizations, etc.), Private sector (e.g. tour operators, travel agencies, accommodation, restaurants, guides, etc.), Non-governmental organizations (e.g. environmental protection groups, local communities, cultural groups, etc.) and finally, Tourists and organizations who represent them. (Miller & Twining-Ward, 2005, p. 183)

As for the entities involved in the activities associated to the development and management of a smart tourism destination (e.g. decision-makers), it can easily be argued that both primary and secondary stakeholders (or all groups) should be adequately represented in these activities in terms of subjects. Unfortunately, that is rarely the case in tourism, as not all stakeholders have equal power and influence in the decision-making process (Ruhanen, 2009). For example, politicians participating in the local or regional government (e.g. mayors, governors, ministers, etc.) typically have a significantly greater influence on decision-making than private sector stakeholders and various NGOs or tourists. Sigala and Marinidis emphasize the importance of cooperation between all stakeholders in the destination. They argue that by combining knowledge, expertise, capital resources and quality strategies, a synergy can be created among tourism stakeholders, which can lead to new opportunities, innovative solutions and a higher level of efficiency and competitiveness that would not be possible without such cooperation (Sigala & Marinidis, 2010).

The division of labour that corresponds with these groups of stakeholders and specific subjects within them can hardly be generalized in any way. In order to be able to address this problem, it is important to make a formal distinction (based on laws and policies) and a qualitative distinction (based on real-life scenarios) of all activities with regard to who is involved in their execution, and in relation to their impact on the outcome of the activity system (i.e. destination development and management). The formal distinction is conveyed in all applicable laws and policies that determine the jurisdiction and liabilities of all subjects that are relevant in the context of the development and management of a destination. As these regulations can vary significantly between two or more destinations, an individual approach is necessary to get the exact notion of who's who and who's responsible for what, where and when. On the other hand, the qualitative distinction (who actually does what and how does he do it) is possible to determine only through extensive qualitative research *in situ* (for example, interviews or focus groups with representatives of all stakeholder groups in a specific destination).

Correspondingly, every destination has rules and norms that define necessary interactions within the

activity system with respect to obligatory legal relationships between all important subjects. These rules and norms are also destination-specific and must be carefully studied and applied in the process of describing the activity system, and ultimately implemented in the information system model. Rules and norms encapsulate all state laws and regulations, acts, policies, development strategies, instructions, and guidelines concerning tourism and the development of tourism destinations in any way (for example, laws on tourist boards and the promotion of tourism, laws on tourist tax, environmental laws, GDPR, national/local tourism development strategies, etc.)

Finally, to complete the activity triangle model of the activity system present in a smart tourism destination, it is necessary to describe the tools used in and outside of the destination, not only by the visitors, but by all subjects in the destinations. Tools can be divided into material and abstract. Material tools refer to all physical means used by subjects to perform different actions and operations (such as computers, smartphones, sensors, etc.), whereas abstract tools include all intangible concepts (such as ideas or information) that affect the activity system. Furthermore, in doing so it is critical to keep in mind that the cycle of a tourist journey consists of three stages: pre-trip (inspiration, decision, purchase), during (purchase, experience, satisfaction) and post-trip (memory, satisfaction) (López de Ávila Muñoz et al., 2015), so it is very important to consider the tools that are used in other stages of travel outside of the destination (i.e. before and after). Last but not least, it is important not only to identify the tools used in the activity system, but also (if possible) to determine where and why they are used, as well as how and why they are developed.

Information and knowledge flows in the destination can be considered the most relevant mechanisms for the general behavior of the activity system. Productivity, innovation, and economic growth are strongly influenced by these flows, and the ways in which information and knowledge are disseminated can determine the speed with which individual stakeholders perform and plan their future activities within the destination. (Argote & Ingram, 2000) Technologies in general, with a special accent on information and communication technology, is probably what made the biggest impact on tourism industry since the beginning of leisure travel. Obviously, a major paradigm shift in tourism occurred with the advent of the Internet, which enabled an unprecedented flow of information worldwide. In addition to the Internet, a variety of information systems also proved to be very important for the global tourism growth (such as Central Reservation Systems (CRS), Global Distribution Systems (GDS), Geographic Information Systems (GIS), Global Positioning Systems (GPS), Decision Support Systems (DSS), Management Information

Systems (MIS), Recommendation Systems (RS), etc.). In the past 20 years technological advancements intensified significantly, with a special emphasis on mobile technology (such as smartphones, tablets, laptops, etc.), which enabled the travelers to be even more informed and perform transactions regardless of where they are. The advancements in mobile technology also influenced the development of some new intelligent systems (such as Virtual and Augmented Reality Systems, Location Based Services, Intelligent Transport Systems, etc.). Out of all tools that are often mentioned in scientific papers related to smart tourism, the Internet of Things (IoT) and big data are the most frequent ones. The International Telecommunication Union (ITU) defines IoT as "...a global infrastructure for the information society, enabling advanced services by connecting physical and virtual things based on interoperable information and communication technologies." (ITU, 2012, p. 1) Big data generally refers to the huge amount of data generated by people and various technologies, which is increasing exponentially on a daily basis, causing problems in the functioning of resources intended for storage, processing and analysis of such data. The fundamental value of big data lies in enabling the formation and management of knowledge. Bernabeu et al. identify the major dimensions that characterize big data: volume (large amounts of data with a high update frequency), diversity (different types and structures of data and multiple channels from which they are collected) and speed (speed of data storage, access and analysis and the ability to display data in real time). (Bernabeu et al., 2016) López de Ávila Muñoz and Sánchez also point out other important characteristics of big data, such as their business value and authenticity, in a sense that they can be used to generate competitive advantages in different areas, and in terms of data reliability, i.e. the quality of information and its accuracy that enables better decision making. (López de Ávila Muñoz & Sánchez, 2013)

Furthermore, some of the most disruptive tools in tourism industry in the past decade have proven to be social media sites and apps (such as Facebook, YouTube, Instagram, TikTok, etc.). Using social media, every individual can be informed in a quick and easy way about the advantages and disadvantages of a tourist service or product before making a purchase decision, but can also inform others about their experience. It is noteworthy to point out that social media users generate huge amount of valuable data, which can be considered an asset for all stakeholders in terms of marketing and decision making.

Although there is an abundance of other tools that are used in tourism, it is beyond the scope of this paper to address all of them. However, it would be a major flop not to emphasize the importance of smartphones and mobile apps in the tourist industry.

This is especially true for the younger generations, who value the experience of getting to know the environment more than the quality of the accommodation and other traditional values in tourism, and such an experience is most accessible using smartphones and appropriate mobile apps. Grieve, Bendon and Hunsdon categorized apps with respect to the type of service they provide:

- apps for providing useful information
- apps related to culture
- transport-related apps
- specialized apps created for the needs of certain companies
- interactive electronic guides
- navigation apps
- accommodation booking apps
- social networks based on location services
- apps based on event information
- travel planning apps

Also, many applications are a combination of two or more of these types and provide several different services at the same time. (Grieve, Bendon, & Hunsdon, 2010)

All of the aforementioned technologies (and many more) combined with the laws, policies, development strategies and other legal acts, form an amalgam of tools that are used by different subjects in a tourism destination in order to achieve their objectives.

6 Towards a Model of a General Information System for Smart Tourism Destinations

One of the main goals of this paper was to set up a theoretical framework for the development of a general information system model that would enable collection, processing, storing and dissemination of tourism related information to support decision-making, coordination, control, analysis, and visualization of data in a smart tourism destination. Such an information system could greatly contribute

to the main objectives of smart tourism destinations in general. In other words, it could support sustainable development of the destination, facilitate visitor's interaction and integration into the environment, improve the tourist experience and the quality of life of residents. The AODM theoretical framework based on the Activity Theory could prove to be adequate for analyzing such a complex system and its main components, as well as the way they interact with each other. Smart tourism destinations represent a complex ecosystem which can be divided into simpler components or dimensions. In relation to that, the aforementioned (SA)₆ framework can be utilized to ease the development of such a system, as it provides a toolset and plausible metrics and indicators for the analysis of smart tourism destination development, along with all its components. The Activity Theory works well with such divisions, as it provides conceptual tools for analyzing and understanding a network of activity systems working together to form a more complex activity. (Engeström, 1999) It is also important to note that the Activity Theory recognizes the contradictions and tensions within the system of activities as a source of change in the activity itself, which corresponds well with tourism. (de Souza Bispo, 2016, p. 173)

As a part of authors previous research, it can be argued that the central activity system of a smart tourism destination can be represented as the sum of activity subsystems (one for each of the dimensions of the (SA)₆ framework), with all the individual components (Tools, Subjects, Rules & Norms, Communities, Division of Labour) comprised as a union of corresponding components for each of the dimensions of the (SA)₆, as shown on Figure 2. (Grzunov, 2020, p. 233-256)

The proposed outcome of this activity system can only be achieved through extensive cooperation of all stakeholders in the system, assuming the responsible actions of all communities with regard to the existent division of labor, in accordance with the applicable norms and rules, and providing appropriate investments in the development and ethical use of all necessary tools.

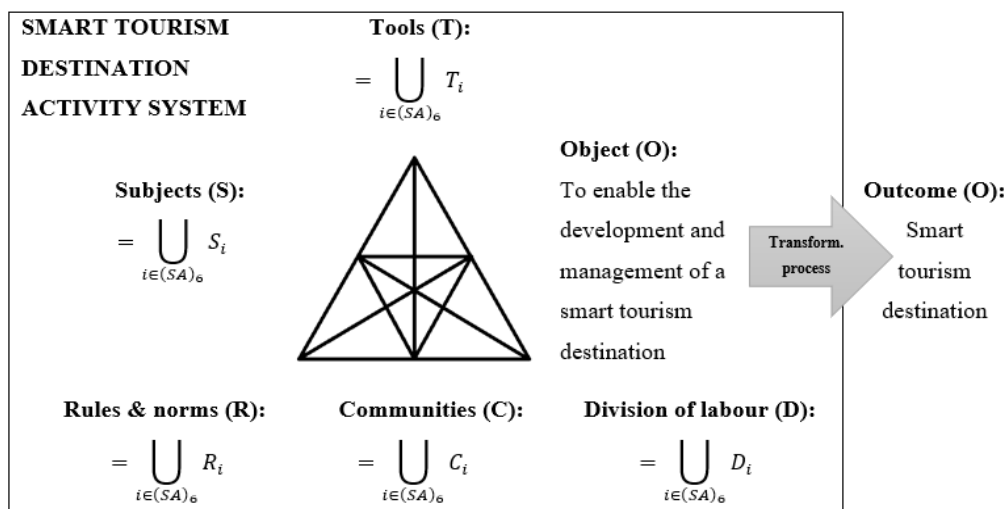


Figure 2. Central Activity System of a Smart Tourism Destination (source: author's work)

7 Conclusion

The proposed theoretical framework provides a good starting point for all further research associated to information systems that could contribute to the development and management of smart tourism destinations, and alleviate the tensions and problems caused by overtourism and poor management of the destinations, as well as the consequences of the recent pandemic. Due to the exceptional complexity of such systems, in terms of different user roles, communication methods, modalities of data collection, structuring and storage, this paper doesn't address any details regarding the entities and links between different system components, as well as specifications of user roles, interfaces, specific communication protocols and other specifics related to the implementation of such a system. Therefore, it is suggested that any future work on this subject should focus on the processes that take place within the system, as well as the exact data types and structures on which its work is based.

The suggested frameworks for analyzing smart tourism destination that were referenced in this paper (namely, the AODM and the (SA)6) can be seen as just one of the numerous possibilities, and by no means taken as a necessity or imperative in future research. Hopefully, the concept of smart tourism will strengthen over time and become a new paradigm in tourism.

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