Adoption of Smart Glasses in Smart Tourism Destination: A System Thinking Approach

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1. Introduction

The tourism industry with its rapid growth, has become one of the biggest industries in the world. It has a direct impact on economic, environmental and social aspects. It is recognised as one of the major economic driving forces which contributes to job creation and generating income. Up until now, several studies have considered determinants of technology acceptance in tourism destinations. Although dominant theories such as the theory of acceptance model (TAM) and the theory of planned behaviour (TPB) can predict human technology adoption behaviour, there is a lack of focus on the interrelations and impacts of various factors in digital ecosystems. Gretzel, Werthner, Koo, and Lamsfus (2015) give a holistic look to smart tourism by considering it as a complex and dynamic ecosystem and emphasises on the interconnectivity of the whole system. In this vein, with the emergent context of travel, the focal concern for smart destinations is to determine tourism experience throughout mobile surroundings (Lamsfus, Martín, Alzua-Sorzabal, & Torres-Manzanera, 2015). Given this background, this paper uses a systems dynamics (SD) approach to build a conceptual model in order to illustrate the adoption of smart glasses in smart tourism destinations. This study also tries to focus and further scrutinise the interrelationships and feedback structures of key players in smart glasses adoption in smart tourism destination.

System Dynamics (SD) is a computer-based approach that tries to analyse a system's behaviour over time. The SD approach has the ability to break down a system into pieces and scrutinize each element of the system to find the impact and outcome of changes on these components at a macro-level. Maani and Cavana (2000) explain in their book, that SD can be applied to a variety of fields and purposes such as designing a new system or improving an existing system. The SD approach is founded on the concepts of interrelationships, feedback structures, and cause and effect. Causal loop diagram (CLD) and stock and flow diagrams play a crucial role in SD modelling. Finding the relations of feedback processes, stock and flow diagrams, time delays and nonlinearities in the system can be considered as an art in SD modelling (Sterman, 2000). The relation among elements of the system and all the causes and effects are shown in CLDs. "A causal diagram consists of variables connected by arrows denoting the causal influences among the variables. Variables are

related by causal links, as shown by arrows. Each causal link is assigned a polarity; either positive (+) or negative (-) to indicate how the dependent variable changes when the independent variable changes. The important loops are highlighted by a loop identifier which shows whether the loop is a positive (reinforcing) or negative (balancing) feedback" (Sterman, 2000, p. 138).

Causal loop diagrams are very strong in structuring a mental model of the system and forming the relations among elements. Coyle (2000) emphasises on the ability of causal loop diagrams in showing the interactions of a system in order to gain a better understanding of its dynamics. CLDs help the modeller to easily convert qualitative dynamic models into quantitative ones. Furthermore, causal loop diagrams are frequently used to study dynamic problems and are aimed at gaining a new perspective towards the problem rather than at its quantification.

2. Theoretical Determinants

2.1. Wearable Augmented Reality Smart Glass and its Applications in Tourism

Mobility of visitors and tourism experience in a mobile environment is the part of contemporary perspective of the smart destination (Lamsfus et al., 2015). AR wearable technologies, like smart glasses with various sensors comprising GPS, microphone, and built-in camera provide immersive information in front of user's eyes. The various features in it can be controlled with various techniques such as gesture, speech, or other methods depending on the smart glass model (Hein & Rauschnabel, 2016). These potentials, according to Tussyadiah (2013); in the tourism context, enables tourists to capture and share travel experience with peer groups with smart glass built-in camera. In addition to navigating with immersive functions in front of your eyes contrary to other mobile devices, the user has to look down and link virtual map in a device with the perceived reality.

2.2. Smart Tourism Destination

Smart tourism destinations mainly focus on visitors and tourists in destinations, and the extent to which they are involved in the interaction with contemporary and cognitive tourism services or, just become familiar with such products (Lamsfus et al., 2015). They also assert that information

and communication technology (ICT) infrastructure in smart destinations has been developed in two-fold: a) Allocating modern mobile technology in the intelligent mobile surroundings; b) Fortifying the cooperation between technology enterprises and tourism stakeholders to foster the foundation of the innovation ecosystem. Dynamicity of Smart Businesses in the smart tourism ecosystems could enhance tourism stakeholders to manage the resources in the automated methods (Gretzel et al., 2015). In Smart Tourism Destination, the portion of real-time information trend produces a notable amount of data sets, that is called Big Data (Buhalis & Amaranggana, 2015). It is essential for ICT infrastructure in smart tourism destinations to be concentrated on both technological and touristic aspect simultaneously.

2.3. ICT Adoption in Tourism

Assessing technology acceptance behaviour has been deployed in previous research in tourism (tom Dieck & Jung, 2015; Young Im & Hancer, 2014). The initial TAM suggests that 'perceived ease of use' which demonstrates the level of user friendliness in specific technology, in addition to 'perceived usefulness,' as the user's perception of specific functionality in such technology are the predictors of end-users' attitude towards technology which finally leads to adoption or rejection of technological innovation (Davis, 1989). For instance, Mathieson (1991) argues that availability of a device is one of the materials for performing the behaviour. Furthermore, in the study on smart glasses, Hein and Rauschnabel (2016) argue that competitiveness of smart glasses refers to the potential of these devices to retain in the industry competitions. Although accessibility and affordability do not guarantee for the user's intention to accept a new technology (Gretzel, Sigala, Xiang, & Koo, 2015), the development of the relevant information via application (apps) in the particular context (Hein & Rauschnabel, 2016) could fortify the user's perception of the functionality for technological innovation.

2.4. Impression of Society in Human Behaviour

Hein and Rauschnabel (2016) assert that social influences play significant roles in the circumstances in which individuals employ an innovation visibly in front of the others. For instance, using ICT advancement vary according to the cultural value for masculine societies with the main focus on self-confidence. The value for work in a person's life compares to feminine societies that are mainly considered modesty and spending more time on leisure activities

(Hofstede, Hofstede, & Minkov, 2010). The other source of the influential attribute in hospitality and tourism industry is word-of-mouth (Litvin, Goldsmith, & Pan, 2008).

Technological innovation also has limitations that could act as an obstacle in the individual's acceptance behaviour. For example, in the survey that was conducted by Morpace Inc. and the University of Michigan-Dearborn, over 1000 U.S. consumers, almost 30% of respondents argued that utilizing smart glasses intimidated others' privacy (Rauschnabel, Brem, & Ro, 2015). Likewise, in the field of smart tourism research, the anxiety with data privacy was declared from respondents as a negative aspect that could thrive in the development of smart tourism destinations (Buhalis & Amaranggana, 2015).

3.   Conceptual Model for Adoption of Smart Glasses

 By using casual loops diagrams as a tool and considering the above-mentioned factors, we tried to focus on understanding the cause and effect relationships of each indicator. The presented CLD (figure 1) is mainly divided into three main sub-systems: subjective norms, smart glasses' technological factors and smart tourism destinations. The presented CLD represents the interrelations among sub-systems and their impact on intention to use smart glasses reinforcing or positive feedback loops, which are symbolised with "R", represent a feedback loop that reinforces the original changes. Balancing or negative feedback loops, "B", counteract the original change (Sterman, 2000).

 As shown in the diagram, the masculine and feminine societies have delayed impacts on social influences. As indicated in CLD, loop B2 is the result of changes in technology related factors such as increase in awareness regarding the functionality of smart glasses that will contribute to increasing the concerns about the people's privacy. The technology mediated experience of using smart glasses in a destination motivates users to use word of mouth to spread what they have experienced (loop R1). In a smart destination, a strong infostructure facilitate the big data process which contributes to the dynamics of smart businesses and can provide a better experience for users. The delays in lead time of smart glasses manufacturer and developing the related and suitable applications will cause a thread of delays in our model. As mentioned, User friendliness of the smart glasses affect the level of functionality perceived by users (loop R2). Meanwhile, availability of smart glasses creates a competitive market that affect the use of smart glasses within

a smart destination (loop R4). Simultaneously, by increasing the dynamicity of smart businesses gradually increase the use of smart glasses increases (loop R3).
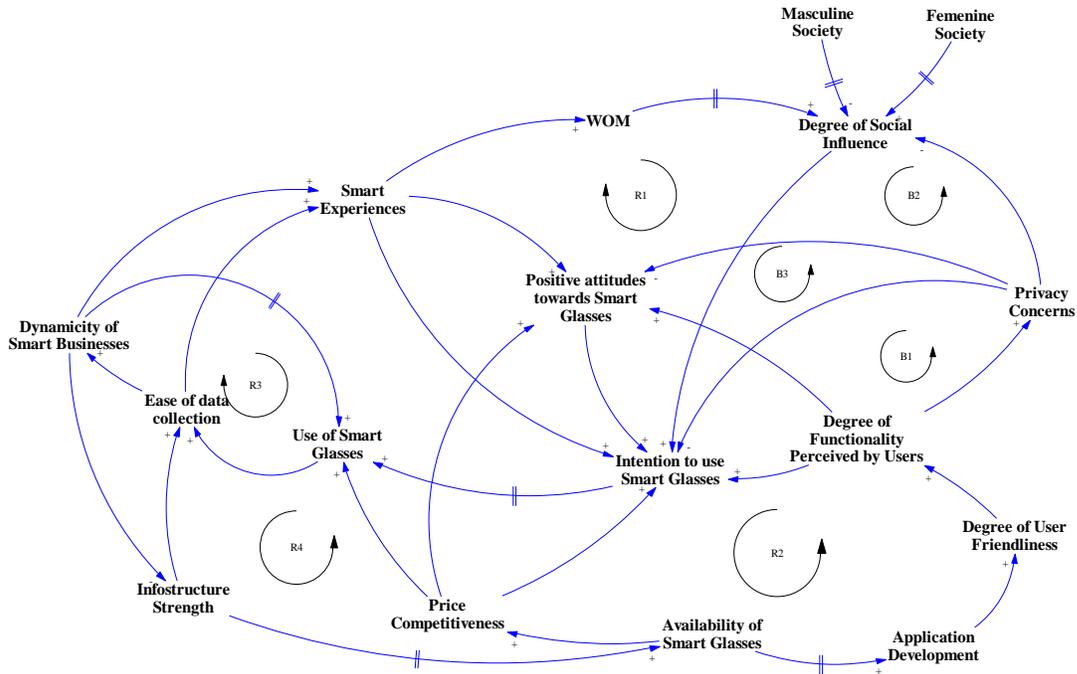

Fig. 1. The proposed CLD for adoption of smart glasses in smart tourism destination

4. Conclusion and Discussion

The preliminary research on the influential parameters of tourists' intention to accept smart glass denoted that social factors were the significant predictors for the behavioural intention to accept smart glass. In addition, the moderating role of culture such as masculinity/ femininity indicated a substantial influence on the tourists' behavioural intention. However, due to the sort of limitation which is also the essence of all research, it is essential to evaluate visitors' post-behaviour with the set of detailed determinants in smart tourism, societal characteristics, and technology adoption behaviour in a comprehensive study.

By using system Dynamics method, we built our proposed framework which can be used as a foundation for further discussion in order to create a holistic approach for smart tourism destinations. Looking deeper into the complex relations of the system helped us to identify key

players and to define essential feedbacks structure of the systems' components and explore interrelations of the intention to use smart glasses in a holistic approach. Generally, the causal knowledge gained from this study and, using CLD, enabled us to see how systems are interconnected and focus on critical feedback structures. Although this study tried to qualitatively illustrate the related factors affecting the intention to use smart glasses, the main challenge which is quantifying these elements still remains ahead. The complexity of the smart tourism, limited case studies or lack of proper data should not prevent us from building a comprehensive and holistic model in this regard. Our future work would be to develop a system dynamics model according to the conceptual framework proposed in this study and to further scrutinize the interrelations and impacts of each element of the system. The dynamic model can provide policy planners and decision makers with a useful tool to achieve a sustainable smart tourism ecosystem.

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