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Planners' Perception of Using Virtual Reality Technology in Tourism Planning

Abstract: Virtual reality (VR) technology has provided a new way for tourism planning and design. It not only allows planners to better implement tourism planning, but also enables tourists to experience the charm of tourist destinations or attractions on a deeper level. However, research on planners' perception of using VR in tourism planning is still in the early stages. Based on the Technology Acceptance Model, this study conducted a depth interview with five senior tourism planners in China to explore factors that influence VR application in tourism planning. The results show that five factors have important influences on VR acceptance, including perceived ease of use, perceived usefulness, perceived cost, perceived enjoyment and perceived immersion. Among them, the first three factors can be summarized as a technical support dimension, and the last two as an emotional feedback dimension. The results provide insights for improving tourists' virtual experience by using VR technology in tourism planning.

Key words: virtual reality, technology acceptance model, tourism planning

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Introduction

The development of virtual reality (VR) first appeared in the 1960s, but it is only now that technology has reached a stage where virtual worlds are realistic enough to create real immersion (Jacobius, 2016). With many consumer grade headsets coming out since 2016, the tourism industry is making more and more use of VR technology, especially in China, where smart tourism development is in full swing. Many attractions, railway stations, airports and hotels have even applied 5G, for instance in VR panorama and live broadcast or AR vision (Panoramic Smart City, 2019). Moreover, during the process of planning and designing of tourism attractions, VR can be used to simulate the usage environment by potential tourists, allowing planners to make design modifications based on users' feedback. For this reason, many tourism planners are using VR as a necessary auxiliary tool during the planning process. However, research on planners' perception of using VR in tourism planning is still in the early stages. This paper explores the factors that influence VR application in tourism planning.

Literature Review

Virtual Reality in Tourism Planning

Sussmann and Vanhegan (2000) highlighted the possibility of creating new (virtual) tourist areas in online communities to help formulate tourism plans and create future tourist destinations together with potential visitors. This ability of VR technology to support future visitors by allowing them to experience things they have not yet experienced is having a significant impact on tourism planning, although, the technical difficulties of VR usability still affect its application (Yung & Khoo-Lattimore, 2019). Currently, while some researchers (Sussmann & Vanhegan, 2000; Argyropoulou, Dionyssopoulou & Miaoulis, 2011) have identified the great potential of VR in tourism promotion, there is still a lack of awareness among researchers and professionals in different travel businesses (Guttentag, 2010; Yung & Khoo-Lattimore, 2019) of its importance in tourism planning .

Technology Acceptance Model

The technology acceptance model (TAM) proposed by Davis (1985; 1989) is one of the most widely used models to explain and predict a user's willingness to use a certain information technology, which often includes attitude and behaviour intentions. Perceived usefulness and perceived ease of use were assumed to be the basic determinants of user acceptance (Davis, 1989). However, Davis paid little attention to external variables (including system design characteristics, user characteristics, task characteristics, nature of development or execution process, policy impact, organizational structure, etc.) (Koufaris, 2002). This paper mainly focuses on factors influencing the acceptance of VR by tourism planners.

Methodology

In order to investigate what the acceptance of VR by tourism planners is like as well as the main factors that influence its application in tourism planning, the authors conducted in-depth interviews with five senior tourism planners in China. Not only is China the first country to have implemented a 5G commercial licence making smart tourism services possible, it also is second only to the United States in terms of VR/AR investments and first for the manufacture of hardware and components, justifying this country as an excellent research case.

Data Collection and Sample

The interviewees were planners in China's leading applied tourism planning, teaching research institutions and held at least a doctoral degree. The sampling approach used in this research integrated snow-ball with convenience sampling (Groenewald, 2004). At first, the authors contacted two leaders working for one of China's top tourism landscape planning institutions to recommend some potential colleagues who might accept an invitation for a personal in-depth interview. These interviewees were then asked to recommend other potential interviewees. As qualitative interviewing should continue until the phenomenon is well explained (Charmaz, 2006), the sample size was not determined a priori but emerged as a

function of the responses given by the interviewees. Face-to-face interviews and textual chatting via WeChat software were used during interviews from March 15th, 2019 to March 22th, 2019 that lasted about 30 minutes each. The recordings of the face-to-face interviews were transcribed in the format of pure text files and the online chatting history was automatically saved by WeChat software in text format. To protect confidentiality, each interviewee was assigned a letter (A to E).

Data Analysis

Thematic analysis (Aronson, 1994; Attride-Stirling, 2001) was applied to analyze the interview records, allowing the themes to emerge that were then aligned with the TAM categories. After each interview, the authors coded the interview data and then classified emerging concepts to form the initial code database. With each additional interview, the number of categories increased as new concepts were found and the authors recoded the data. Once no new concepts emerged, the authors started a process of axial coding (Glaser & Strauss, 1967) to seek and establish the relationship among different concept categories. For instance, the authors read data classified by initial codes such as “convenient”, “helpful” and “important for presentation” and found these codes are related each other. Lastly, selective coding was implemented whereby the authors created themes based on the concepts developed during axial coding. Continuing with the last example, a theme of “perceived usefulness” was identified.

Findings

The complete application process of VR in a specific tourism planning project includes data preparation, VR modeling and VR rendering. This last step is directly related to the “VR end-user application”. In actual planning projects, the work of planners is usually subdivided as VR modeling requires the mastery of programming skills.

Five factors were found to have important influences on VR acceptance: perceived ease of use, perceived usefulness, perceived cost, perceived entertainment and perceived immersion.

These can be further grouped under technical support (perceived ease of use, perceived usefulness and perceived cost) and emotional feedback (perceived entertainment and perceived immersion).

Perceived Ease of Use

The interviewees' evaluation of the difficulty of applying VR depends on the planning phase during which it is used. The interviewee who demonstrated the planning scheme by using VR equipment (such as VR glasses) thought that its operation was simple. *"I learned to operate it in a few minutes."* (#A). Interviewee C also felt that *"It's quick, easy, and I learned it soon. But it should be very difficult to deal with the programming. We outsourced it to the company at that time."* However, technicians who use complex operations such as VR modelling believe it is very difficult. For instance, Interviewee D explained the use of VR for the large Nanchan Temple restoration project, whose main hall is the earliest existing wooden structure in China and whose many Buddha statues all need to be restored: *"Because it is very difficult to make the magnificent feeling of Buddha statue by manual method, the hardware method is used to scan and model it. The structure of the temple is large, artificial modelling, mapping and integration into the engine using unity3D technology, and then output, using HTC glasses for testing. There are five or six of us who have been working for a month, but there are still some technical difficulties."*

Perceived Usefulness

All the respondents recognized the role of VR in tourism planning and were positive and optimistic about its development prospects. They described their feeling as follows: *"VR can be of great help for planning at the park level. The application of VR in the tourism planning industry will become a trend."* (#A). Interviewee D went even further: *"VR is not only a way of presenting, but also a tool for capturing user behavior. Data can be collected*

through VR to form a user behavior database, which can be used for adjustment and evaluation". This means VR *"has a certain guiding role in planning and design."*

Perceived Cost

Perceived cost includes capital cost and time cost. There are great differences among respondents with regards to perceived cost as the main influencing factors are more complex. First of all, due to the different VR products used by respondents, their evaluation of perceived cost is also different. While Interviewee A *"use[s] HTC glasses, about RMB 6,000, not very expensive"*, Interviewee D spent *"RMB 20,000, including helmet handles and computer connection software."* The difficulty of the project is another factor that causes the respondents to diverge in their assessments. The more difficult the project is, the higher the perceived cost of applying VR. Several of the interviewees have participated in an European internship, an annual field trip which allows participants to collect landscape and architecture data that is added to a resource database for VR modelling, to refine the use of VR for other projects. Interviewee C described the European internship in these terms: *"[they] bought a 360-degree camera (four fisheye lenses), fixed-point photography, input VR equipment, automatic stitching to form the scene."* Finally, the interviewees' technical ability is a subjective factor that influences their perception of cost. While Interviewee B thought *"VR is a challenging technology. I know little about VR before, so it will take me some time (to learn)"*, interviewee D who had *"been exposed to VR for 15 years"* thought he *"can operate it well."*

Perceived Enjoyment and Perceived Immersion

The interviews also showed that interviewees experienced a sense of pleasure when using VR, but focused on using VR output devices. *"When I wear a helmet, I think it's funny. It's novel! And then I'm willing to continue trying later."* (#C). As one of the important characteristics of VR, immersion has always been a concern for users. The results show that planners are more or less able to create a sense of immersion. Interviewee B thought *"When*

using VR, there is a roaming feeling.” While interviewee D felt VR has potential, he also expressed some caution: “VR can now simulate the five senses, vision, touch, smell and so on. There is a sense of immersion, but the solution is not good, and there is a big gap between them and reality.”

Relationship among Factors

Interviewees believe that the cost of VR in tourism planning has an impact on its ease of use, but the direction of the effect depends on the application scenario. At present, VR is mainly used in the display of planning results and simulation of tourists' preferences during planning. The requirements for VR equipment to showcase projects are relatively simple: *"small device, good mobility, and software operation should be compatible with ordinary computers. Such equipment, e.g., VR glasses, is relatively low cost and easy to use".* (#B). However, *"if a good immersion effect is required, such as helmet and fixed induction equipment, it will be unsuitable for promotion"* (#B), since it would be expensive and cumbersome to install and remove. Meanwhile, the equipment and software used for VR modelling and programming are of relatively high technical difficulty, and respondents believe that the system with high cost requires more effort and time to use.

Interviewees clarified that the ease of use positively impacts their perceived usefulness of VR. "VR is an assistive tool that is much easier to modify and allows people to feel directly. Therefore, VR can be of great help planning at the park level" (#A). It is worth noting that several interviewees mentioned that their perceived cost positively influences the perceived immersion of using VR technology. "Current VR products are immersive, but there is still a big gap between them and reality. The main reason is that we haven't invested a lot of money to support it." (#D). They also believe that the perceived immersion has a positive influence on their perceived enjoyment of using VR technology. "Immersion and entertainment are definitely related, the better the effect (of the immersion), the more fun it is." (#E).

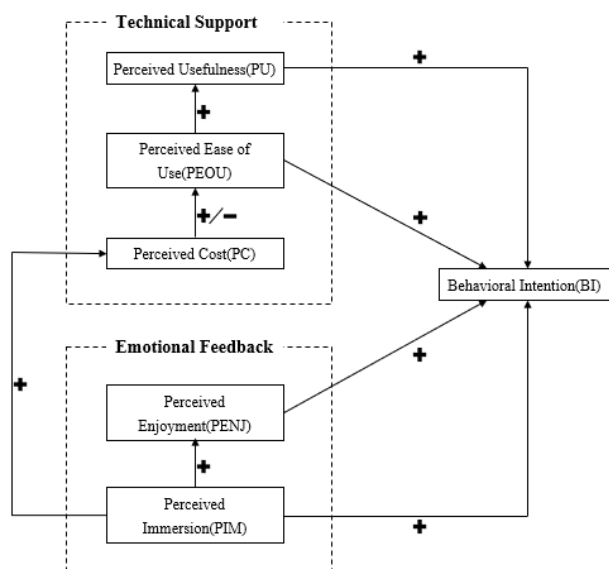


Figure 1. Acceptance model for VR technology

Conclusion

This study clarifies the factors that affect the acceptability of VR technology for planners, including perceived usefulness, perceived ease of use, perceived cost, perceived entertainment and perceived immersion. An extended TAM applicable to VR technology in the context of tourism planning is proposed (see Figure 1). Four factors other than the perceived cost directly affect the acceptance of VR. In the technical support dimension, the impact of perceived cost on ease of use can be positive or negative, depending on the VR application

scenario. Perceived ease of use positively impacts perceived usefulness. In the emotional feedback dimension, the perceived immersion of VR positively affects perceived entertainment. Between the technical support dimension and emotional dimension, perceived immersion has a positive impact on perceived cost.

It is of great theoretical importance to identify and determine the main factors that affect users' acceptance of VR. An extended TAM suitable for VR in the context of tourism planning is constructed from an empirical perspective. The investigation of the influence factors of planners' perception on VR acceptance is also important from a practical point of view as it is becoming an emerging aspect of tourism planning. For destination marketing organizations and tourism enterprises, the findings of this study can be used as a reference to assist with cost-benefit decisions for VR investment, which is conducive to destination marketing and promotion, so as to enhance their competitiveness and social influence. For tourists, VR applications can enhance their travel experience.

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