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# Can virtual tourism aid in the recovery of tourism industry in the COVID-19 pandemic?

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## 1. Introduction

The COVID-19 pandemic has imposed tremendous and unprecedented impacts on the tourism industry in China and worldwide (Gössling, Scott, & Hall, 2021). The World Tourism Organization (UNWTO) reported a 70% decline in international arrivals (a loss of $730 billion in export revenues) for the first eight months of 2020 (UNWTO, 2020). "This unprecedented decline is having dramatic social and economic consequences, and puts millions of jobs and businesses at risk" (UNWTO, 2020). In the absence of effective vaccines and pharmaceutical interventions, non-pharmaceutical interventions (NPIs) (e.g., quarantine and isolation, travel restrictions, school and workplace closures, event cancellation) have been mainly used to suppress the spread of the coronavirus and respond to the COVID-19 outbreaks (Cowling et al., 2020; Lai et al., 2020). Implementing those NPIs require residents to stay at home and reduce unnecessary trips. Consequently, we argue virtual tourism can have great potentials to aid the recovery of tourism industry, since people are recommended or required to stay at home and reduce unnecessary trips during the COVID-19 pandemic and the only access to tourism is "virtual".

New technology advances, such as "virtual reality" (VR) and "augmented reality" (AR), can empower the tourism industry and bring new opportunities. The tourism sector should take advantage of new technology and virtual tourism to respond and adapt to the challenges imposed by COVID-19. In this study, we give a broad definition of virtual tourism (also called "cloud tourism" in some contexts), not only including VR and AR but also live broadcast and streaming of tourism. AR is to augment the reality at the tourism destination by projecting the computer-generated image onto a real-world view to immerse the tourists in a completely new environment (Burdea & Coiffet, 2003; Guttentag, 2010; Vince, 2004). However, since tourists cannot go for an on-site visit during the pandemic, AR is not included in this study. Virtual reality (VR) is defined as "the use of a computer-generated 3D environment – called a 'virtual environment' (VE) – that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user's five senses" (Guttentag, 2010; Yung & Khoo-Lattimore, 2019). The VE can be created from either synthetically generated or real-captured images (Beck, Rainoldi, & Egger, 2019). Recently, 360° VR has gained popularity in creating VR content. Real-world spherical panoramic 360° images and videos are stitched together to create 360° panoramic views, where users can move virtually and change view perspective allowing for a sense of verisimilitude (Beck et al., 2019; LaValle, 2016; Slater & Sanchez-Vives, 2016). The general public when staying at home can enjoy a realistic and immersive virtual tourism experience via monoscopic 360° VR using an online app or video via any devices such as smartphone, computer, television, or VR headset, while stereoscopic VR can only be viewed via a professional VR headset or glasses. Additionally, most of the live broadcast and streaming for tourism in China are not strictly VR technology since it does not generate a 3D virtual environment. Nevertheless, live streaming of tourism has been a trending phenomenon during the pandemic in China (CGTN, 2020) that many tourism destinations, travel agencies, and individuals launched live streaming of tourism via a variety of platform, such as Tiktok, Wechat, Kwai, Weibo, Mafengwo, etc. during the pandemic. The live streaming can be considered as "virtual". Thus, we consider live streaming of tourism as an important component

in virtual tourism in this study. VR continues to evolve over time since its emergence and has been applied in many areas in the tourism industry, such as marketing, entertainment, education, accessibility, and heritage preservation (Guttentag, 2010).

This study is built upon the theory of planned behavior (also known as reasoned action approach) (Ajzen, 1988, 1991; Fishbein & Ajzen, 2010) to understand people's behaviors or acceptability in using virtual tourism during the pandemic. The theory of planned behavior suggests that an individual's intention to perform a given behavior is associated with three factors: attitude towards the behavior, subjective norms, and perceived behavioral control (Ajzen, 1988, 1991; Fishbein & Ajzen, 2010). This study aims to investigate the factors and constraints that influence the general public's behaviors or acceptability in using virtual tourism during the pandemic in China and explore how virtual tourism can aid the recovery of tourism industry during and post the pandemic through a mixed-methods approach, combining a quantitative survey (N=1,288) and qualitative interviews (N=30). To the best of our knowledge, this study is the first attempt to explore how virtual tourism can help with the recovery of tourism industry during and post the pandemic.

# 2. Methods

The mixed-methods approach has emerged as a "third paradigm" for social research as a viable alternative to quantitative paradigm and qualitative paradigm (Denscombe, 2008), which allows us to provide a complete picture and better understanding of the role of virtual tourism by taking a consideration of the qualitative-quantitative complementarity (Fleckenstein et al., 2020; Johnson & Onwuegbuzie, 2004; Molina-Azorín & Font, 2016). Here, we gave equal priority to both quantitative and qualitative approaches and gathered the information simultaneously (Molina-Azorín & Font, 2016) given the urgency to understand the role of virtual tourism, especially during the pandemic.

## 2.1 Data collection

We used a mixed-methods approach, combining online quantitative survey and qualitative interviews. The online survey was administrated between Apr. 29th and May. 19th in 2020 in China. A total of 1288 questionnaires were received. All subjects completed the questionnaires voluntarily and anonymously without receiving any reward. The online survey was developed and distributed in an online anonymous survey platform (https://www.wjx.cn/).

Besides the quantitative data collection, we also conducted 30 interviews between Apr. 29th and Aug. 10th in 2020 and the average length of each interview was around half an hour. An interview guide was developed with the collaboration of five team members. The contents included identifying awareness and understanding of virtual tourism and usage and experience of virtual tourism. The interviewee was asked to compare the user experiences of two virtual tourism formats — tourism live streaming and 360° virtual tours — using an example of the Imperial Palace Museum in Beijing, China and talk about how the virtual tourism will influence their desire for an on-site visit after the pandemic. During the interview, we played a recording of a tourism live streaming of the Imperial Palace Museum (about 5 minutes; people.com.cn (2020)) using a smartphone for each interviewee. After that, we asked the interviewee to use an online app of 360° virtual tours (Palace Museum (2020); https://pano.dpm.org.cn/) on a smartphone to view different scenic spots in the Imperial Palace Museum. The interviewee was also asked to talk about whether he/she prefers to use virtual tourism to visit cultural heritage (e.g., Imperial Palace Museum) or

natural landscape (e.g., Jiuzhai Valley National Park) and whether the interviewees are still willing to use virtual tourism post the pandemic without concerns of COVID-19 and what the reasons are.

2.2 Statistical analysis

We performed a binary logistic regression model to investigate what factors will influence the use of virtual tourism. The dependent variable is a dichotomous variable: having ever used virtual tourism or not. The independent variables include attitudes towards virtual tourism including alternative functionality and entertainment functionality, social norm, perceived behavior control, awareness, travel desire, frequency of browsing the pictures/videos/websites of the tourism destination, and willingness to access virtual tourism. Gender, age, income, and education level were used as the covariates. We employed an iteratively reweighted least squares (IWLS) method to fit the logistic regression model and used McFadden's pseudo $R^2$ (McFadden, 1974) to approximate the proportion of variance in the dependent variable that has been explained by the model. We also conducted a Hosmer-Lemeshow test for goodness of fit to assess the performance of our model by assessing matchness between expected and observed event rates in subgroups (Hosmer, Hosmer, Le Cessie, & Lemeshow, 1997; Lemeshow & Hosmer, 1982).

# 3. Results

Before this survey, more than half of the respondents (57%) have heard about virtual tourism (e.g., internet live streaming tourism, 360° virtual tours, 3D virtual reality glasses, etc.). During the pandemic, about 30% of the respondents have ever used virtual technology (e.g., tourism live streaming, virtual tour, VR headsets) to experience the tourism destination. The majority of the respondents show positive attitudes towards virtual tourism that 62% of the respondents strongly agree or agree that due to personal protection needs, virtual tourism is a good alternative to on-site visits and 69% strongly agree or agree that virtual tourism can be used as a new form of entertainment which can make people relax. Qualitative analysis of the interview data reveals distinct, yet complementary, attitudes towards virtual tourism from the interviewees. The interviewees expressed diversified attitudes including both positive and conservative attitudes towards virtual tourism.

With respect to types of tourism destination that the respondents use virtual tourism to experience, the museum is the most popular type (60.5%). Historical sites and natural landscapes follow the museum. The majority of the interviewees (67%) stated that virtual tourism is more suitable for cultural landscape, which is because for the natural landscape, it will be much better to go for an on-site visit to enjoy the scenery in different time points/seasons and breath the clean air, while for cultural landscape, the major purpose of visiting cultural landscape is to learn more knowledge.

Our logistic regression model indicates that the three constructs in the theory of planned behavior: attitude towards virtual tourism (i.e., virtual tourism as a new form of entertainment bringing relaxation), social norm, and perceived behavioral control are positively associated with the use of virtual tourism. Moreover, the respondents who have heard of virtual tourism, who browsed the pictures, videos, or websites of the tourism destination more frequently, and who are willing to use virtual tourism, are more likely to use virtual tourism. The major barrier for not using virtual tourism is lack of familiarity with and not being aware of virtual tourism and this conforms to the logistic regression model that the respondents who have heard of virtual tourism are more likely to use virtual tourism and the qualitative data that several interviewees expressed that virtual tourism should be promoted and advertised more to the general public.

When comparing the user experience between live streaming and 360° virtual tour, about 53% of the interviewees stated that they preferred 360°virtual tours and 47% preferred live streaming. As for the advantages of 360° virtual tour, more than half of the interviewees (60%) stated that 360°virtual tours have high flexibility and autonomy that the users can choose when to use the virtual tour, flexibly alter the angle of view, and choose the scenic sites that they are interested in. Regarding the advantages of the live streaming, more than half of the interviewees (53%) stated that the interpretations from the tour guide (broadcaster) are very intriguing and vivid and the storytelling can better show the culture and history of the destination.

For those tourism destinations that the respondents have ever browsed via virtual technology, after the pandemic is over, the majority of the respondents (84.8%, n = 382) responded that they will choose one of the tourism destinations for an on-site visit. About 61% of the respondents responded that the experience of virtual tourism will have a very strong or strong influence on how they choose tourism destinations for on-site visits. With respect to willingness to use virtual tourism post the pandemic, about half of the respondents (49%) are willing or very willing to use virtual tourism post the pandemic. The interviewees were also asked whether they are still willing to use virtual tourism after the pandemic is over. About 90% of them indicated they are willing to use virtual tourism and the reasons mainly include: virtual tourism can help visitors know about the tourism destination in advance and plan their trips before they go (56%); virtual tourism can save time and money and visitors are able to visit tourism destinations that they cannot go because of certain constraints (e.g., time, financial, distance, accessibility, etc.) (52%); virtual tourism is a new technology to experience and can be an entertainment activity (15%), etc.

## 4. Conclusion and discussion

The use of virtual tourism can be partly explained by the theory of planned behaviors. Virtual tourism shows great potential to aid the recovery of the tourism industry. Both qualitative and quantitative results reveal that virtual tourism has a strong influence on how people choose tourism destinations for on-site visits and can stimulate people's desire to visit on-site. Virtual tourism can be used as an effective marketing tool for companies, agencies, and governments to promote tourism destinations. Moreover, to aid the recovery of the tourism economy, online selling of souvenirs and related products could be bundled with live streaming and 360° virtual tours.

The museum is the most popular type that the respondents have ever visited via virtual tourism, and virtual tourism would be useful especially for museums due to two reasons. On the one hand, virtual tourism is very suitable for displaying the exhibits in a museum, since the virtual tours can display a high-quality 3D view of the artwork accompanied by detailed description of the artwork without any influences or damages to the artwork. On the other hand, the risk of contracting the coronavirus is much higher in a poorly ventilated and crowded indoor area (e.g., museum) than outdoors, that transmitting coronavirus in a closed environment is 18.7 times greater compared to an open-air environment (Nishiura et al., 2020). Thus, during the pandemic, the museum or other cultural landscapes, especially indoor scenic sites, should start or continue to assimilate virtual technology as an indispensable component in their products and services.

Virtual tourism can enhance the "virtual accessibility" of the general public, especially for the elderly and disabled with limited mobility. The majority of the interviewees mentioned virtual tourism can save time and money and enable visitors to visit the tourism sites that they cannot go

to because of certain constraints and barriers (e.g., time, financial, distance, accessibility, etc.). Two interviewees indicate that virtual tourism is especially helpful for the elderly and disabled with limited mobility who are not able to or challenging to go outside, to enjoy an immersive tourism experience in virtual tourism. Also, virtual tourism offers a valuable opportunity for poor people to enjoy the scenery in the natural landscape and learn the culture and history in the cultural landscape. The quantitative data suggested that the use of virtual tourism is not associated with income and "economic constraints" is the least important barrier/reason.

Virtual tourism is also helpful to reduce transmission of the coronavirus and contain COVID-19 for those countries who are still undergoing serious impacts from the pandemic via reinforcing the stay-at-home order and NPIs measures. Both the quantitative and qualitative data show that virtual tourism can be a new entertainment activity to bring people relaxation and immersed experience in a tourism destination when staying at home without directly being in a tourism destination or a museum. This can, to some extent, reduce the peoples' desirability and possibility to go outdoors and travel, and thus reinforce stay-at-home order, which can help reduce the transmission of coronavirus.

The virtual tourism industry shows a very promising future. Even after the pandemic is over and travel restriction is lifted, people still show a willingness to use virtual tourism. About 90% of the interviewees stated that they are still willing to use virtual tourism after the pandemic is over. The main reasons are to know about the tourism destination in advance and plan their trips before they go, to visit tourism destinations that they cannot go to because of certain constraints (e.g., time, financial, distance, accessibility, etc.), and to experience new technology and to be an entertainment activity to relax. Virtual tourism can offer potential visitors a "try-before-you-buy" experience and a sneak-preview of a destination.

Reference:
Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago, US: Dorsey Press.
Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. doi:10.1016/0749-5978(91)90020-T
Beck, J., Rainoldi, M., & Egger, R. (2019). Virtual reality in tourism: a state-of-the-art review. *Tourism review (Association internationale d'experts scientifiques du tourisme), 74*(3), 586-612. doi:10.1108/tr-03-2017-0049
Burdea, G. C., & Coiffet, P. (2003). *Virtual reality technology*: John Wiley & Sons.
CGTN. (2020). "Cloud" tourism becomes fad amid COVID-19 outbreak. Retrieved from https://news.cgtn.com/news/2020-03-21/-Cloud-tourism-becomes-fad-amid-COVID-19-outbreak-P2kwXA1dC0/index.html
Cowling, B. J., Ali, S. T., Ng, T. W. Y., Tsang, T. K., Li, J. C. M., Fong, M. W., . . . Leung, G. M. (2020). Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: an observational study. *The Lancet Public Health, 5*(5), e279-e288. doi:10.1016/S2468-2667(20)30090-6
Denscombe, M. (2008). Communities of Practice: A Research Paradigm for the Mixed Methods Approach. *Journal of Mixed Methods Research, 2*(3), 270-283. doi:10.1177/1558689808316807
Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: the reasoned action approach*. New York, US: Psychology Press.

Fleckenstein, M., Lythgoe, A., Lu, J., Thompson, N., Doering, O., Harden, S., . . . Prokopy, L. (2020). Crop insurance: A barrier to conservation adoption? *Journal of Environmental Management, 276*, 111223. doi:10.1016/j.jenvman.2020.111223

Gössling, S., Scott, D., & Hall, C. M. (2021). Pandemics, tourism and global change: a rapid assessment of COVID-19. *Journal of Sustainable Tourism, 29*(1), 1-20. doi:10.1080/09669582.2020.1758708

Guttentag, D. A. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management, 31*(5), 637-651. doi:10.1016/j.tourman.2009.07.003

Hosmer, D. W., Hosmer, T., Le Cessie, S., & Lemeshow, S. (1997). A comparison of goodness-of-fit tests for the logistic regression model. *Statistics in Medicine, 16*(9), 965-980. doi:10.1002/(SICI)1097-0258(19970515)16:9<965::AID-SIM509>3.0.CO;2-O

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher, 33*(7), 14-26. doi:10.3102/0013189X033007014

Lai, S., Ruktanonchai, N. W., Zhou, L., Prosper, O., Luo, W., Floyd, J. R., . . . Tatem, A. J. (2020). Effect of non-pharmaceutical interventions to contain COVID-19 in China. *Nature, 585*(7825), 410-413. doi:10.1038/s41586-020-2293-x

LaValle, S. M. (2016). *Virtual Reality*. Cambridge, U.K.: Cambridge University Press.

Lemeshow, S., & Hosmer, J. D. W. (1982). A review of goodness of fit statistics for use in the development of Logistic regression models. *American Journal of Epidemiology, 115*(1), 92-106. doi:10.1093/oxfordjournals.aje.a113284

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in Economics*. New York, US: Academic Press.

Molina-Azorín, J. F., & Font, X. (2016). Mixed methods in sustainable tourism research: an analysis of prevalence, designs and application in JOST (2005–2014). *Journal of Sustainable Tourism, 24*(4), 549-573. doi:10.1080/09669582.2015.1073739

Nishiura, H., Oshitani, H., Kobayashi, T., Saito, T., Sunagawa, T., Matsui, T., . . . Suzuki, M. (2020). Closed environments facilitate secondary transmission of coronavirus disease 2019 (COVID-19). *medRxiv*, 2020.2002.2028.20029272. doi:10.1101/2020.02.28.20029272

Palace Museum. (2020). 360 virtual tour of the Palace Museum. Retrieved from https://pano.dpm.org.cn/

people.com.cn. (2020). Retrieved from http://v.people.cn/n1/2020/0406/c413792-31662780.html

Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing Our Lives with Immersive Virtual Reality. *Frontiers in Robotics and AI, 3*(74). doi:10.3389/frobt.2016.00074

UNWTO. (2020). International tourism down 70% as travel restrictions impact all regions. Retrieved from https://www.unwto.org/news/international-tourism-down-70-as-travel-restrictions-impact-all-regions

Vince, J. (2004). *Introduction to virtual reality*: Springer Science & Business Media.

Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism, 22*(17), 2056-2081. doi:10.1080/13683500.2017.1417359