Virtual Tourism Initiative for Visitor Flow Management in the New Normal Era

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Abstract—**Tourism has been hardest hit by the COVID-19 pandemic from all sectors of the economy, both in terms of demand and supply. Therefore, to support tourism activities in the new normal era, this lab-based experiment has initiated the development of web-based virtual reality (Web-VR) virtual tourism content as part of visitor flow management from destination managers. The location of this research is Kampung Warna Warni (Colorful Village) Jodipan in Malang City which is a theme-based village tourism and managed independently by the community. Its location has an attractive and strategic position as one of the tourist icons of Malang City but has the carrying capacity and capacity that is indicated contradictory in supporting the health protocol of COVID-19. This research uses R&D method with a qualitative approach consisting of passive participatory observation methods to evaluate tourism carrying capacity destinations, visual documentation of 360° photos for making Web-VR and close ended question interviews to assess the quality of the websites that have been built. The results of this study indicate the tourism carrying capacity of these destinations is vulnerable and has a high potential risk of operating in the new normal era. Based on the assessment of the laboratory-based experiment, the virtual tourism content that has been initiated can be a form of implementation of a soft system management which is part of visitor flow management which is able to reduce the duration and the crowd while increasing the user experience. The content is considered to have met the minimum standard website service, although in the future it needs to be complemented by further empirical research from the perspective of tourists in fields-based experiment.**

Keywords—virtual tourism, visitor flow management, tourism carrying capacity, new normal

I. INTRODUCTION

The COVID-19 pandemic has been declared the worst public health emergency in modern history by many countries. The COVID-19 pandemic has hampered tourism by triggering various policies such as physical distancing, social distancing, travel restriction and the new normal era in various countries. Tourism has been the hardest hit of all sectors of the economy, both in terms of supply and demand.

By carrying out hashtags such as Stay Safe, Travel Responsibly and the #traveltomorrow campaign, The United Nations of World Tourism Organization (UNWTO) has called on tourism businesses and tourists to show a sense of responsibility and solidarity, make wise decisions to maintain the standard COVID-19 Health protocol while traveling so that the risk of spreading and transmitting the virus from tourism travel can be minimized and support pandemic recovery. However, exploring and wandering is one form of activity in ancient human civilization that is still ongoing, so it is difficult to stop it from daily life even for a while. In addition, in the midst of a pandemic, entertainment and recreational activities are needed to reduce boredom and public panic.

Malang City has an ideal known as Tri Bina Cita because of the commitment of the local government to develop the region by referring to 3 aspects, namely: Education, Tourism and Trade (industry). This causes Malang City to become one of the cities in Indonesia that depends on the tourism sector. One of the iconic tourist destinations for Malang City is Kampung Warna Warni Jodipan, which is a theme-based village tourism (thematic village).

Before the formation of Kampung Warna Warni Jodipan was a slum settlement. Efforts to improve the environment have been carried out by the Jodipan community in an effort to improve the environment, namely by cleaning the environment, painting and affixing colorful murals on walls, roofs and fences as well as installing ceramics on the road so that Jodipan has succeeded in changing the image and identity of Jodipan as a tourist attraction that is in great demand. by tourists and able to improve the economy of the local population through tourism. Kampung Warna Warni Jodipan and Malang City tourism in general were also affected by the pandemic. This appalling condition threatens regional income from tourism, especially in tourist destinations managed by non-corporations and non-governmental organizations.

Even though it was temporarily closed for the past 6 (six) months to minimize the pandemic, the tour located in Kampung Warna Warni Jodipan, Klojen District, Malang City finally reopened in September 2020 by tightening the COVID-19 health protocol for visitors such as requiring visitors to wear

masks, wash their hands. and check body temperature. Even though it has been supported by an increase in good environmental awareness from the community, the conditions of the Kampung Warna Warni Jodipan are the conditions of sanitation, accessibility, accommodation, amenities and ancillary services in these destinations are not optimal enough to allow the spread of viruses and bacteria.

Therefore, to support tourism activities in the new normal era, this research offers a solution in the form of developing virtual tourism content based on virtual reality websites (Web-VR) so that tourists can travel but can reduce the duration of being on the destination site by completing direct visits with virtual visits. and at the same time assisting destination managers in visitor flow management to reduce physical contact and social contact as well as tourist crowds during the pandemic.

All management processes, in turn, consist of a series of stages whose objective is to produce a result that improves a current state. In this way, the primary goal of visitor management processes is to conserve the site and improve visitor experience [1]. The use of virtual tourism is expected to help reduce the problem of destination mass tourism without destroying the tourist experience.

Destination managers have been calling for some level of control over visitor use and visitor management approaches [2-4]. Kuo states [5], "successful tourism development requires management to be focused upon not only tourism resources but also visitors". So, this research tries to present a win-win solution in the midst of the problems of implementing tourism activities in the new normal era.

The use of virtual reality technology in the context of tourism or what is known as virtual tourism can be defined as interactive digital media that allows users to take part in creating a simulated experience of the actual environment using a layer of virtual reality devices [6]. By shifting the quantity of direct tourist visits through virtual visits, previous research has shown that virtual tourism can complement real or complementary visits [7] or be used by tourists as an alternative to real visits or substitutions [8], temporarily, for example in a disaster or pandemic full lockdown area. Virtual tourism offers a realistic experience and allows "visits" to environmentally sensitive sites that are unsuitable for many visitors [9], especially during pandemic conditions. VR substitutes would not always involve accessing a virtual site from afar, as VR could be used on a site's premises as a substitute for a particularly vulnerable section of the site. Such implementation may be perceived as a more satisfactory substitute simply because the tourists would still have the experience of visiting the real site [6].

II. RELATED WORK

The list of world tourist destinations, which can be accessed virtually as virtual tourism, continues to grow where various tourist destinations in the world have been digitized in the form of a virtual reality model, such as the Palmyra City in Syria [10], Mtskheta City in Georgia [11], Pompeii City in Italy [12]. In Indonesia, there are only a few studies that develop virtual tourism content with lab-based experiments such as Bandung City [13] which is used as a tool in visitor flow management to maintain a destination's carrying capacity of the tourism.

So far, no research has been found on the use of virtual reality and its relation to visitor flow management. Several previous studies have inspired research on the use of digital technology such as GPS Tracker [14], creation of 3D models [15] geographical mapping [16] and augmented reality for vehicle traffic management [17]. Therefore, this study tries to fill the research gap.

A. Virtual Tourism

Virtual tourism is associated with contemporary internet use and consumption of tourist space in a digital way in relation to internet tourists or e-tourists [18]. Furthermore, Fauzi and Gozali [13] stated that virtual tour is a technology that places the user in the image and allows the user to increase situational awareness and significantly increase the ability to see, capture and analyze virtual data. Basically, a virtual tour is a location simulation that consists of a series of still images that are combined to produce a 360° panoramic photo.

B. Web-Based Virtual Reality

Web-Based Virtual Reality (WebVR) is a JavaScript API for creating immersive virtual reality experiences within the browser. Panoramic photo shooting uses a spherical type that allows you to look up and down (horizontally) as well as left and right (vertical) or 360°. The spherical panoramic photos are then put together in the form of a gallery image, allowing users to visit various locations in one web view and feel as if they have taken an immersive "tour."

C. Visitor Flow Management

According to Eagles et al., [19], "the practice of ensuring visitors achieve a quality experience; it is the management of visitors in a manner which maximizes the quality of the visitor experience while assisting the achievement of the area's overall management objectives", and they state that visitor management seeks to meet the needs of visitors, and according to them visitor management refers to a "client-oriented approach to planning and service delivery that considers the visitors' needs, expectations and satisfaction". For Shackley [20] major concerns in visitor management are entry charges, local business development, and potential damage to the heritage resource, congestion, reduction of visitors in peak times, and dealing with segments of visitors aside from direct visitor flow management.

D. Tourism Carrying Capacity

The World Tourism Organization defines carrying capacity as "the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic and socio-cultural environment and an

unacceptable decrease in the quality of the visitors" [16]. Carrying Capacity is the point when more visitors will damage the environment or lower people's enjoyment below an acceptable level [21]. Tourism Carrying Capacity (TCC) issues concern the number of tourists, visitor flows and spatial patterns of concentration/ dispersion vis-à-vis the protection of nature and the functioning of ecosystems but also the quality of visitor experience [22].

E. Website Quality

Service quality is a measure of how well a service meets customer expectations which can be measured using the SERVQUAL model [23]. In its development, it was adopted specifically for e-commerce businesses, especially those using websites, so that the WEBQUAL model emerged. WEBQUAL has now evolved into WEBQUAL 4.0 is a method or instrument for assessing the quality of an organization's ecommerce offering using user perceptions. WEBQUAL was developed by Barnes and Vidgen [24], composed of 3 dimensions (usability, information quality and service interaction quality).

III. METHODOLOGY

A. Research Design

This type of research is Research and Development (R&D) with a qualitative approach of observation, visual material and close-ended question interview testing using the Multimedia Development Life Cycle (MDLC) model. The MDLC method has 6 (six) stages, namely concept, design, material collecting, assembly, testing and distribution [25].

B. Data Collection Methods

For the conceptual stage, this research uses passive participatory observation, in which the researcher comes directly to observe the tourism carrying capacity of the destination but does not get involved in activities at the location of Kampung Warna Warni Jodipan. Second, for the material collection stage, visual documentation of this research is carried out for taking pictures by researchers for the main material for making virtual tourism content in the form of 360 ° photos related to cultural heritage objects in the research location. Third, for the testing phase of this study using a close-ended interview question by testing virtual tourism content on informants, namely by involving 5 (five) content users, namely fellow researchers in the laboratory (lab-based experiment) where the informant did not know beforehand about the system/design/implementation of multimedia content developed by researchers and informants are asked to evaluate the quality of the VR-web website developed by researchers.

C. Analysis Procedures

This study uses an interactive model from Miles and Huberman [26] to analyze the research data consisting of data collection, data reduction, data display, and conclusion.

D. Research Focus

During conducting passive participatory observations, the researcher measured the Tourism Carrying Capacity of Kampung Warna Warni Jodipan using 3 (three) basic indicators from Coccossis and Mexa [22] which consisted of physical-ecological, socio-demographic, and political-economic. For the interview method with a close-ended question, the researcher aims to measure the quality of web-VR-based virtual tourism content with 3 (three) WEBQUAL 4.0 indicators from Barne and Vidgen [24] consisting of usability, information quality, and service interaction quality.

E. Data Validity

In this study, checking the validity of the data using triangulation of sources. Checking is done by comparing what the research subjects said in the interview and comparing with the results of observations, observations and visual documentation [25].

IV. RESULTS AND DISCUSSION

A. Passive Particitation Obsevation Results

At this stage the researcher identified the conditions for the Tourism Carrying Capacity in Kampung Warna Warni Jodipan by using observation guidelines by adopting an assessment indicator [22]. Observations were made directly before the entry of the COVID-19 pandemic in Malang City, as shown in table 1.

TABLE I.   TOURISM CARRYING CAPACITY OBSERVATION IN KAMPUNG WARNA WARNI JODIPAN

Indicators	Items	Result	Conclusion
Physical-ecological indicators	Natural Environment and Biodiversity	Little green open land	Not Good
	Air Quality	Near highways causes pollution from high vehicle exhaust emissions	Not Good
	Noise Pollution	Near highways and densely populated settlements	Not Good
	Energi	Commercial energy dependence	Not Good
	Water	Polluted river	Not Good
	Waste	People's awareness has improved but waste management is still not optimal	Not Good
	Cultural Heritage	There are several colonial houses in poor condition	Not Good
	Tourist Infrastructure	There is no accommodation and items such as adequate parking space	Not Good
	Land	Prone to erosion	Not Good

Table 1. Cont.

Indicators	Items	Result	Conclusion
	Landscape	Artificial scenery is an attraction	
	Transport and Mobility	Access roads are narrow and easy to crowd	Not Good
Socio-demographic indicators	Demography	Densely populated area	Not Good
	Social Behaviour	Awareness increased about village empowerment	Good
	Health and Safety	There is no visitor health service center. There is no disaster mitigation route	Not Good
	Psychological Issues	The residents realized the tourism potential and increased hospitality	Good
	Tourist Flow	Long queues and congested crowds on normal days. Difficulty social and physical restrictions	Not Good
Political-economic indicators	Tourism Earnings and Investments	Providing high income for local people and development investment coming.	Good
	Employment	660% of residents depend on local tourism income.	Good
	Policy for Tourism Development	As one of the icons of Malang City	Good
	Public Expenditure and Revenue	Glass bridges were built, improved facades of houses and road access, which benefited the community	Good

Based on the results of the researchers' observations, it can be determined that Kampung Warna Warni Jodipan has a low tourism carrying capacity, has a potential risk of high urgency and in the future, it can threaten the sustainability of these tourist destinations, especially if operating in the new normal era, especially related to population density and environmental problems such as those in the future. shown in the areal photo Figure 1. Out of a total of 11 observation items for physical-ecological indicators it shows that Kampung Warna Warni Jodipan has a physical-ecological condition problem in all question items or 100%. In addition, from a total of 5 question items for the Socio-demographic indicators, it was found that these sites and destinations were rated poorly on the 2 question items with a percentage of 70%. Even though the Political-economic indicators can be fulfilled properly and there are no obstacles or equal to 0%.

Fig. 1. Drone aerial photography of *Kampung Warna Warni Jodipan*.

According to Hogwood et al., [27], there are two types of failure during visitor management process: the first is non-implementation, and the second type is unsuccessful implementation. The absence of cooperation between stakeholders may lead to non-implementation of visitor management policy, and the failure to match the intended results may also lead again to a sort of unsuccessful visitor management performance. Various reasons were suggested for implementation failure, including poor policy framework, non-compliance among stakeholders, poor task definition, and inadequate information and resources. Therefore, the results of the identification of tourism carrying capacity have shown that visitor flow management from Kampung Warna Warni Jodipan is not optimal.

B. Visual Documentation Results

Virtual tourism content for the Kampung Warna Warni Jodipan was developed based on WebVR. WebVR used in this study is A-Frame. The results of observations and audio-visual material at the concept, design and material collecting stages are carried out directly at the Kampung Warna Warni Jodipan using the Camera 360 application to obtain spherical images. While the assembly stage is carried out to combine the spherical series of images into the gallery image on the A-Frame and form the Badut Temple Web-VR content as can be accessed on the link *http://05-mlgkzr.glitch.me*.

Fig. 2. Kampung Warna Warni Jodipan Web-VR.

C. Interview with Close-Ended Question Result

After the virtual tourism content is built, this study uses the interview method to get user opinions about the quality of the website from the virtual tourism content of Kampung Warna Warni Jodipan based on web-virtual reality (Web-VR) using Web Qual 4.0 from Barnes and Vidgen [24] as shown in Table 2.

TABLE II.　WEBSITE QUALITY WEB-VR KAMPUNG WARNA WARNI JODIPAN

Indicators	Items	I	II	III	IV	V
Usability Qualities	The degree of easy to learn	Yes	Yes	Yes	Yes	Yes
	The degree of easy to operate	Yes	Yes	Yes	Yes	Yes
	Has an attractive appearance	Yes	Yes	Yes	Yes	Yes
	Appropriate to the type of site	Yes	Yes	Yes	No	Yes
	Conveys a sense of competency	Yes	Yes	Yes	No	Yes
	Create a positive experience	Yes	Yes	Yes	Yes	Yes
Information quality	Provides accurate information	Yes	Yes	Yes	No	Yes
	Provides believable information	Yes	Yes	Yes	Yes	Yes
	Provides timely information	No	Yes	No	No	No
	Provides relevant information	Yes	Yes	Yes	No	Yes
	Provides easy to understand information	Yes	Yes	Yes	Yes	Yes
	Provides information at the right level of detail	Yes	Yes	Yes	No	Yes
	Presents the information in an appropriate format	Yes	Yes	No	No	Yes
Service interaction quality	Has a good reputation	Yes	Yes	No	Yes	Yes
	Secure the personal information	Yes	Yes	Yes	Yes	Yes
	Creates a sense of personalization	Yes	Yes	No	Yes	Yes
	Conveys a sense of community	No	No	No	Yes	No
	Makes it easy to communicate with the management or customer service	No	No	No	No	No

The results of this study indicate that the website quality of virtual tourism content in Kampung Warna Warni Jodipan based on web-VR meets the minimum standard based on the WebQual 4.0 indicator. Usability qualities associated with site design and usability; for example, appearance, ease of use and navigation, the image conveyed to the user and positive experience. The five content user informants stated that these indicators could be fulfilled properly.

The quality of the content of the site: the suitability of the information for the user's purposes, e.g., accuracy, format and relevancy. The five content user informants stated that these indicators were sufficiently fulfilled. Service interaction quality, the quality of the service interaction experienced by users as they delve deeper into the site, embodied by trust and empathy. The five content user informants stated that this indicator was able to be fulfilled even though it was still not good.

These results are in line with the opinion Liu [28] regarding tourism capacity, the concept is generally defined as the maximum number of visitors an area could accommodate without there being excessive deterioration of the environment or declining visitor satisfaction. In other words, and in a more active sense, as Papageorgiou and Brotherton [29] suggest, to maintain the integrity of the basic resources and provide a tourist experience of high quality. This research shows that good website quality can add to the experience of use and ease of use and prove that using virtual tourism content can be an important solution in increasing carrying capacity where management is able to manage visitor flow management while providing new tourism experiences.

In addition, the use of virtual tourism as part of visitor flow management is also considered in line with research Kuo [5]. The results of the study were recognized the approaches to enhance the use of visitors and site management. He suggests that there are two approaches to visitor management, namely hard visitor management and soft visitor management. Hard visitor management approaches to aim to regulate visitor activity as well as to minimize their negative impact. The aim of hard regulatory policies is to ensure the protection of the environment and reduction of the conflicts between tourists and traffic congestion, while soft visitor management approaches aim to deliver information so as to provide an enjoyable experience for visitors. It can be said that the use of virtual tourism content is a form of soft regulatory that can support the creation of visitor flow management.

V. CONCLUSION AND FUTURE SCOPE

A the results of this study indicate that the tourism carrying capacity of the theme-based village tourism destinations, namely Kampung Warna Warni Jodipan, is vulnerable and has a high potential risk of operating in the new normal era, especially because it has problems in terms of physical and ecological factors. Virtual reality in the form of virtual tourism content is believed to be part of the soft system for visitor management, which is useful for dealing with mass tourism managers, whose implementation can contribute to visitor flow management to reduce the duration of visits, reduce physical and social contact, break up the crowd of tourist flows but at the same time increase the quality of visitor experience that can support the COVID-19 Health protocol. Virtual tourism content that has been initiated can be a solution based on a lab-based experiment assessment because it has met the minimum standard website quality, especially in terms of usability quality. Although in the future it needs to be equipped with further empirical research from the perspective of tourists in the fields-based experiment with a quantitative approach.

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