

# Proposed Virtual Reality Implementation in Toraja Tourism to Improve Accessibility and Foreign Interests

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**Abstract.** The COVID-19 epidemic has had a substantial impact on the tourism sector in Toraja, producing a large drop in regional income. Despite efforts by the local government and Toraja tourist administrators to resuscitate the tourism industry through exhibitions and promotion, these programs have had minimal success. Digital disruption and a lack of corporate interest are stifling the growth of Toraja tourism. As a result, the purpose of this paper is to investigate tourism innovation by providing an integrated platform with 3D tourism adventures, as well as enabling government partners and local MSMEs with the use of virtual reality as a method of attracting domestic and foreign tourists. This study focuses on the use of virtual reality technology to improve access in Toraja, which currently suffers from a lack of amenities and infrastructure. Tourists can now enjoy and explore many tourist spots in Toraja digitally, allowing them to appreciate the dynamic ambiance and natural beauty of the place from afar. Furthermore, the purpose of this study is to assess the efficacy of the virtual reality tourism innovation concept in enhancing the interest of domestic and foreign tourists in Toraja, with a particular focus on accessibility. Local governments and tourist managers in Toraja can establish more effective strategies to promote and improve the tourism sector in the future by knowing the possibilities and benefits of virtual reality technology.

**Keywords:** COVID-19 epidemic, Toraja Tourism, Virtual Reality Technology, Government.

## 1 Introduction

The tourism sector has become a crucial aspect in the economic advancement of a country. Tourism has emerged as the primary choice for regional development. The development of tourism has undergone significant changes in terms of patterns, forms, and nature of travel activities to tourist destinations, among others. The development of an area can create new attractions for both foreign and local tourists. Indonesia has abundant tourism potential that can boost the country's economy if each tourism object is well- managed by the government and relevant stakeholders, leading to an increase in foreign exchange earnings through visitor arrivals. In this regard, the role of promotional strategies in tourism planning is vital. Tourism planning has become crucial due to the increasingly complex phenomenon of tourism, intensified competition, and the aggressive promotion of tourist destinations not only within Indonesia but also in other countries. Tourism influences everyone in a particular

community. Therefore, all parties involved in tourism need to actively participate in the tourism planning process to ensure that Indonesia can compete with other countries in the field of tourism.

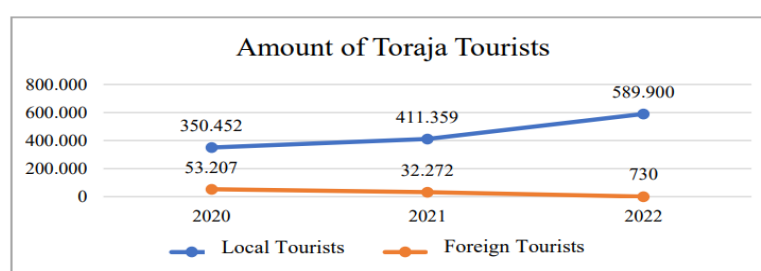
Tourism not only has a positive impact by increasing regional income, but it also benefits industry players such as the hospitality sector with the growing number of hotel visits. Therefore, activities are needed to direct the development of tourism and ensure it remains a trusted sector that contributes to the increase in regional income. The implementation of Law Number 10 of 2009 concerning tourism is an integral part of national development carried out systematically, planned, integrated, sustainable, and responsible while still preserving the values of religion, culture that live within society, environmental sustainability, and national interests.

One of the regions in Indonesia that has a well-known tourism potential is Toraja. The government designated Toraja as one of the Destination Management Organizations (DMO) in 2010. DMO is a tourism destination management organization that includes tourism planning, coordination, implementation, and control in Indonesia. As many as 15 DMOs have been established and among them are Sabang, Toba, Kota Tua, Pangandaran, Borobudur, Bromo-Tengger-Semeru, Batur, Rinjani, Flores, Tanjung Puting, Derawan, Toraja, Bunaken, Wakatobi, and Raja Ampat. In 2019, the government added a new National Strategic Tourism Area (KSPN) called Toraja and Mendeh. Previously, there were 10 KSPNs that had been managed in accordance with the Presidential Regulation (PP) Number 56 of 2018, which are Lake Toba, Tanjung Kelayang, Tanjung Lesung, Seribu Islands, Borobudur, Bromo-Tengger-Semeru, Mandalika, Labuan Bajo, Wakatobi, and Morotai. The tourism potential of Toraja lies in its natural resources, local culture, and the number of tourist visits. In addition, the area also has a significant contribution to increasing income, both locally and nationally.

Nevertheless, as 2020 approached, the scheduled expansion of tourism encountered obstacles due to a spike in the global Covid-19 outbreak, which affected Indonesia as well. Monitoring the state of Toraja tourism during the Covid-19 pandemic is crucial owing to the pandemic's global impact on various aspects of life, including the tourism industry, which has been severely impacted. The government has taken significant measures to control the spread of the Covid-19 virus, including implementing a social distancing policy, which entails avoiding close physical interactions, crowded places, maintaining cleanliness by regularly washing hands, and wearing masks. These interventions are assumed to be effective in curtailing the virus's spread. During the pandemic, the tourism industry in North Toraja and Tana Toraja, renowned for their cultural and natural splendor, has been relatively quiet. The local authorities have postponed community events on numerous occasions, including limiting access to tourist destinations and canceling traditional festivities such as Rambu Tuka' and Rambu Solo'. This had a profound impact on Tana Toraja's tourism sector. Although there was a marginal decrease in the number of Covid-19 cases in Tana Toraja from November 2020 to June 2021 due to vaccination campaigns, there has been an upsurge in positive Covid-19 cases in recent weeks. Consequently, tourist sites that have not been officially opened by the local authority have been closed again.

During the Covid-19 epidemic, the tourist destination known as Lolai or The Land Above the Clouds, alongside several other tourist sites in North Toraja, were temporarily closed for approximately two months to support the government's efforts in preventing the spread of Covid-19. This closure had adverse effects on tourism services, economic stakeholders, tourist visits, management and administration of tourist attractions, as well as the capacity of tourism facilities and resorts to accommodate visitors. In a meeting with tourism business managers on Wednesday (10/6/2020), the Head of North Toraja Culture and Tourism Service expressed the

government's intention to gradually reopen some select tourist attractions while adhering to approved health protocols. However, in 2021, there has been a continuous increase in positive coronavirus infections in North Toraja Regency. As of February 3, 2021, 16:00 WITA, data from the North Toraja Covid-19 Task Force indicates 545 confirmed positive cases and 24 deaths. The manager of the Lolai tourist area also acknowledged the detrimental impact of the Covid-19 pandemic on the tourism industry since mid-2020. There has been a significant decline in visitor numbers, especially during school holidays and year-end periods. Furthermore, a noticeable reduction in the influx of vehicles into the tourist area at daybreak has been observed. Whereas Lolai used to be bustling with visitors before the pandemic, particularly in the early morning.



**Fig. 1.** Toraja Tourist Development Chart

Source : Tana Toraja and North Toraja Central Statistics Agency 2023

Based on the data presented in the aforementioned table, there is a significant disparity between the number of local and foreign tourists annually. This disparity can be attributed to the inverse relationship between Toraja's attraction potential and the actual ground conditions. Consequently, it is imperative to address several issues within the Toraja tourism sector. The following are among the challenges facing the Toraja tourism industry:

- a. Tourist attractions in Toraja are difficult to find because there are no signs suggesting hidden tourist sites, and it is difficult to enter these tourist attractions.
- b. Tourist attractions' facilities and infrastructure are unfinished and poorly maintained, especially road access to the location, which needs to be improved.
- c. Local communities' lack of interest in building tourist attractions.
- d. The Tourism Department's lack of oversight over tourist attractions.
- e. Few tourist attraction operators in Toraja use social media as a promotional strategy. Even some well-known tourist destinations do not have social media accounts.
- f. Organizing unsustainable tourism necessitates the cooperation of the business sector. However, amidst these challenges, we contend that there exist untapped prospects to be investigated. One such prospect involves the integration of novel technologies to enhance the visitor experience. For instance, the incorporation of virtual tours and online booking systems could augment accessibility and restore potential tourists' confidence. Moreover, partnerships between the public and private sectors could be established to invigorate the local economy, particularly in response to the decline in tourist numbers. The global tourism industry has undergone significant alterations due to the Covid-19 pandemic, and Toraja has not remained unaffected. Nevertheless, within these challenges lie opportunities that can be explored. By implementing innovative strategies and engaging in meaningful collaborations, there is a promising prospect for the resurgence of Toraja's tourism industry beyond the pandemic.

## **2 Literature Review**

### **a. Accessibility**

Tourism accessibility is a means that provides convenience for tourists in order to get to a tourist destination of interest [1]. There are several very important factors that are interrelated with aspects of tourist accessibility including terminals, airports, directions, time required, frequency of available transportation, how much it costs to get to tourist locations. [2]

Tourist accessibility is composed of various components, both physical and non-physical. Based on Government Regulation No. 50 of 2011 concerning the Master Plan for National Tourism Development for 2010-2025, it explains that accessibility in tourism includes the development of transportation facilities and infrastructure from various forms of transportation starting from road, river, sea, air and rail transportation. In organizing accessibility for tourists, it must also include providing access to information, which is realized by providing reliable signs and information [3]. The implementation of accessibility can also be influenced by the role and form of involvement of the government and local communities [4].

From the theoretical understanding above which explains accessibility, it can be concluded that accessibility is something that can make it easier for tourists to get to tourist destinations and tourist attractions by paying attention to the role and involvement of the government and local communities in its implementation.

### **2.2 Foreign Interest**

Interest in visiting can be analogous to interest in buying. Interest is a strong internal drive and is influenced by positive feelings towards the product being stored, a person is motivated to take action [5]. Foreign interest tourism refers to tourism that serves specific interests of tourists, such as cultural, sporting, or environmental interests, rather than mass tourism. Special interest tourism is a form of alternative, ethical, or environmentally responsible tourism that aims to diversify tourism options in a destination. Foreign tourists who undertake special interest tourism are often interested in learning about local culture and participating in activities related to their interests. To support sustainable tourism development, it is recommended to focus on alternative forms of tourism that can diversify tourism options in destinations [6].

### **2.3 Virtual Reality Tourism**

Virtual Reality or VR is a digital tool or instrument that aims to help users experience a real environment in the form of 3D image simulations [7] several tools that support VR services are special applications in the Google application, and several other tools that are web and mobile based which will help users experience a simulated environment such as a virtual tour from where they live. [8] Thanks to live virtual experiences it is possible that tourists visit directly the destinations of interest, facilitating their decision making to choose which destination information best meets their needs [9]. With these capabilities, VR is used in

various sectors and lines, including the newest business sector in the tourism sector. [10]. Likewise, it shows that emotional experiences motivate customers to visit a destination. The impact of VR experiences on intentions to visit tourist destinations [11]. This shows that there is an immersive virtual experience that will influence the intention to visit and recommend and the desire to come to the destination. [12] In the tourism industry itself, VR is being adopted for several reasons. Firstly, VR allows visitors to interact and visitors can determine where the tour will go in the tourist destination they want to visit. This will give the impression and feeling of being in a real environment so that existing users and visitors can form a strong bond which will give rise to the attractions available at the chosen tourist destination. [13]. And, prospective tourists will have the opportunity to visit tourist destinations without having to go to visit them and without physically traveling so that it will attract interest in visiting. [14].

### **3 Method**

This research uses a qualitative descriptive methodology with data search techniques using library research. The data in this research was analyzed to explain how virtual reality has an influence on increasing accessibility and foreign interest in tourism in Toraja using the Penta Helix collaboration concept. Literature study research is carried out using data collection techniques sourced from published journals, previous research, or summaries of other sources originating from media or platforms related to research. The data analysis carried out in this research is an analysis in the form of a bibliography study by presenting a literature review. The main source of information for this research comes from analysis of previously published research findings and other documents related to the research objectives. More than ten publications that have data related to handling Covid-19 were used in this research. Furthermore, primary data provided by the tourism office is used to cross check data validation and data updating. In this research, the data analysis method used in this research is qualitative data analysis [15]. The theoretical basis is used as analysis and interpretation related to research problems. [16]

The data in this research is combined with literature study techniques because this research was conducted online, which means it only relies on information sources via electronic platforms. Researchers collected data from the Central Statistics Agency of the Toraja Tourism Service to observe developments in the number of tourists each year. Apart from that, this proposal has a positive and negative influence on knowing the accessibility and interest of foreigners in the tourism sector in Toraja.

### **4 Result and Discussions**

Toraja is a region in South Sulawesi, Indonesia which is famous for its unique culture, traditional houses and beautiful natural scenery. Behind its beauty, Toraja still has actions or behavior that are considered bad practices in the context of tourism because they can have a negative impact on the environment, culture and local communities. There are potential bad practices that occur in Toraja:

- a. Disregard for Local Culture: Numerous tourists display a lack of consideration for local customs and traditions.

- b. Denigration of Local Customs: Tourists often ignore or show disrespect towards local customs, rituals, and traditions, which not only offends the local community but can also result in the degradation of the destination's cultural heritage.
- c. Environmental Issues: Careless disposal of waste by many individuals poses severe threats to natural habitats, leading to adverse consequences for the local environment.
- d. Uncontrolled Development: Haphazard construction of hotels, resorts, and other tourism-related infrastructures without proper planning and adherence to regulations can cause environmental degradation, and compromise the authenticity of the local culture.
- e. Cultural Appropriation: Exploitation of elements of local culture for commercial purposes without a thorough understanding and appreciation of their significance is deemed as cultural appropriation.
- f. Insufficient Support for the Local Economy: If the majority of tourists prioritize international networks over supporting local businesses, the economic benefits of tourism may fail to reach local communities in their entirety [17].

The centrality of accessibility in tourists' journeys to tourism destinations is emphasized. [18] Essential prerequisites for achieving this include adequate transportation facilities and supporting infrastructure, particularly roads that enable convenient travel to tourist destinations. Accessibility is commonly measured as a criterion to gauge the ease of time, cost, and effort required for travel. The successful development and attractiveness of government-initiated tourist destinations significantly influence tourists' choices. [19] However, the challenge of insufficient supporting facilities and infrastructure, particularly in terms of road accessibility, persists. [20]

According to the North Toraja Tourism and Culture Office, the number of tourists visiting North Toraja Regency in 2022, from January 1 to December 31, reached 261,806, while Tana Toraja Regency recorded 480,631 visitors [21]. To enhance accessibility to key tourism destinations in the region, the North Toraja Regency (Pemkab) continues to allocate resources for infrastructure development. Amson Padolo, the Acting Regent of North Toraja at the time, affirmed that the operation of Buntu Kunik Toraja Airport plays a vital role in attracting more tourists to the area. This aspect is recognized as a focal point that demands substantial attention [22].

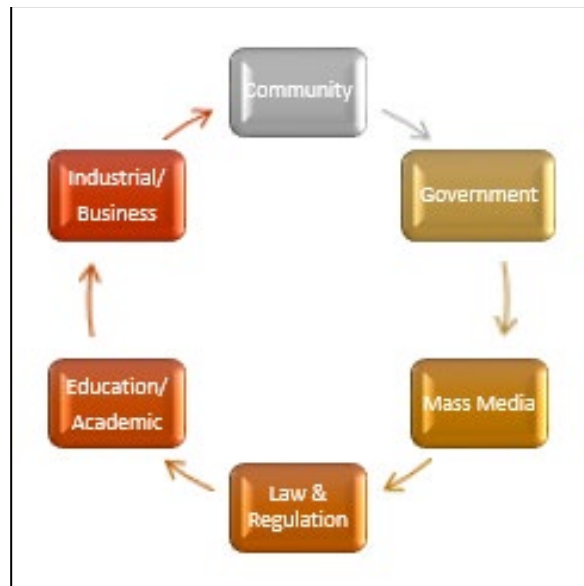
The South Sulawesi Central Statistics Agency noted that there were 88 hotel room accommodations in Tana Toraja and 384 hotel rooms in North Toraja. In terms of numbers, it is sufficient, but if there is a surge in visits then hotel rooms and other accommodation will be less available even though the hotel is currently quite old. Quoted from the Sulesprov website, it can be seen that there are investment opportunities in the tourism sector, especially for developing tourist attractions and developing tourism amenities to support MICE (Meeting Incentive Conference Exhibition) tourism [23]. Economic growth and investment in a region or country cannot be separated from the availability of infrastructure, including transportation, telecommunications, sanitation and energy. The presence of this infrastructure is considered a supporting basis. By increasing the number and improving infrastructure by the government, it is hoped that it will stimulate economic growth [24]. Therefore, the importance of infrastructure support is crucial in strengthening the tourism sector in Toraja, contributing to economic growth and global competitiveness.

In light of the various potential negative practices observed in Toraja's tourism industry, it is essential for tourists, the local community, and the government to collaborate in promoting responsible and sustainable tourism. To ensure that tourism brings benefits to the Toraja community, concerted efforts must be made by the government, private sector, and society.

The ways to achieve success and mitigate the potential negative practices in Toraja, the implementation of a Virtual Reality (VR) tourism platform can effectively address these issues by reducing the adverse impacts of physical tourism, such as environmental and cultural damage. Through VR tourism, individuals can virtually visit Toraja without the need for physical travel. This technology also plays a crucial role in raising tourist awareness regarding the importance of preserving Toraja's nature and culture. Moreover, VR tourism contributes to Toraja's development by attracting more tourists and supporting cultural advancement. It is important to note, however, that while VR tourism offers numerous advantages, it cannot completely replace the authentic physical experience in Toraja.

According to Law Number 10/2009 concerning Tourism, what is meant by tourism is various kinds of tourist activities which are supported by various facilities and services provided by the community, entrepreneurs, the Government and Regional Government. In the current digital era, it is necessary to adapt technology-based media that is able to support MSME activities in Tana Toraja [25]. In its implementation, the tourism sector requires Pentahelix collaboration which is the key to tourism growth in Toraja. [26]

- a. Community, the Toraja people have joined AMAN (National Indigenous Peoples Alliance).
- b. Government, the Ministry of Cooperatives is collaborating with local Toraja MSMEs to develop souvenir businesses at tourist attractions. The Tourism Office in Toraja is holding a program, namely providing guidance and counseling to communities around tourist attractions to create a tourism-conscious community, preserving traditional culture around tourist attractions, culinary culture, and helping to increase the beauty and friendliness of visitors.
- c. Mass Media, the Tourism Office maximizes social media as a promotional platform for Toraja Tourism to the public, for example on Instagram @visittorajautara.
- d. Law and regulation, customary law is still strong among Toraja indigenous people and there is an allocation of tourism management funds of 40% for the government and 60% for indigenous communities.
- e. Academic, Many students and other academics are holding community service programs and looking for solutions for tourism development in Toraja.
- f. Business, the role of this organization is very important due to their independent nature and paying high attention to community welfare, environmental sustainability and other crucial matters. This private organization is very close to the community, and the community itself has a high sense of belonging to this private organization. In 2021, PT Inhutani provided Corporate Social Responsibility (CSR) to Tana Toraja Regency in the form of trash cans to preserve forests in Tana Toraja. HM Sampoerna carried out CSR to the Kete Kesu tourist destination in North Toraja by providing rubbish bins.



**Fig. 1.** Pentahelix Collaboration Model

The four aspects of tourism, as mentioned by, [27] are crucial in promoting the success and sustainability of tourism in Toraja. Let's further discuss each aspect:

- a. **Attraction:** To meet the changing demands of the tourism market, it is important for Toraja to develop diverse and unique attractions. Currently, the attention given by the government to tourist attractions and tourism infrastructure development in Toraja is insufficient. However, notable attractions, such as the Rambu Solo traditional ceremony, showcase Toraja's unique culture. The government's annual festival programs, such as the Toraja Carnival, contribute to increasing tourist attraction.
- b. **Accessibility:** Enhancing transportation facilities and infrastructure is essential in improving tourist accessibility to various attractions. The condition of roads in Tana Toraja and North Toraja is a major challenge, with a significant percentage of roads experiencing damage. Providing detailed information about transportation options, including air travel, is crucial for tourists. This includes considering the needs of Muslim tourists, such as halal restaurants and places of worship.
- c. **Amenities:** While Toraja has interesting tourist attractions, the availability of adequate facilities plays a vital role in sustaining tourism. Accommodation, food and beverage options, and services for purchasing souvenirs are important factors in enhancing the attractiveness of Toraja as a tourist destination.
- d. **Ancillary Services:** The presence of private organizations in the tourism sector, such as associations for tour and travel agencies, hotels and restaurants, and tourist guides, can significantly contribute to the progress of tourism in Toraja. Currently, Toraja does not have these organizations, but many Toraja people have joined the National Indigenous Peoples Alliance (AMAN) and traditional community associations, which can play a supportive role.

In conclusion, by addressing the aspects of attraction, accessibility, amenities, and ancillary services, Toraja can further develop and sustain its tourism industry. It requires



collaboration between the government, local community, and private sector to maximize the potential of Toraja's tourism attractions and provide quality services to tourists.

From intricate issues to innovations in the utilization of virtual reality to enhance tourist attractions in Toraja and augment the count of local and foreign tourists, Virtual Reality (VR) application represents a feasible solution. With regards to VR technology, our preference is the technology offered by Mark Zuckerberg's Meta Company, owing to its profound commitment to bolstering VR development. This is evidenced by the remarks of the CEO of Meta, cited in the company's name change conference, which articulated the main thrust of the company to align with its investment in the Metaverse. Furthermore, in advancing virtual tourism, our collaboration has also encompassed KAT VR Company. Established in 2013, KAT VR is an independent research and development company responsible for VR hardware and software that endorses secured, realistic, and immersive virtual reality experiences. To realize Reaverse (Artificial Tourism), the following stages were implemented:

- a. Research Stage: Data were collected and processed based on the requirements and preferences of consumers when traveling virtually in Toraja. To implement Reaverse, vital data such as the annual attendance of local and foreign tourists, the number of micro, small and medium-sized enterprises (MSMEs) in Toraja, tourism intelligence on Toraja, and other relevant parameters are needed.
- b. Design Stage: The design of the user interface and user experience is implemented on all features stipulated in Reaverse. Platform display applies the Technology Acceptance Model (TAM), positing that system proficiency and advantages influence users' acceptance. The initial design was put in place to provide a preliminary idea of Reaverse implementation.
- c. Development Stage: Application of all designed concepts and data is implemented. This involves the creation of the application framework in the form of source code and the exhaustive application of this code.
- d. Test Stage: Testing, both on internal and external users, is conducted. This stage is aimed at determining performance results and evaluating existing challenges.
- e. Implementation Stage: The platform is sufficiently advanced and ready for use by all users. Also, socialization is conducted to highlight its functions and how to use the platform. Users can download Reaverse from Play Store or App Store, and they can use it.
- f. Maintenance Stage: Reaverse application is updated, maintained, and evaluated annually to avert potential user difficulties and guarantee enhanced user experience. Also, this development aligns with the requests and requisites of all concerned parties.

Departing from the goal of ensuring that tourism in Toraja remains accessible despite its remote location, the concept of Reaverse, or artificial tourism, emerged. Reaverse leverages digital technology to transform Toraja's tourism objects into a virtual version. The application allows users to experience Toraja from a first-person perspective. To achieve this, three technologies and one application are utilized to create a 360-degree effect in Reaverse:

- a. Oculus Headset;
- b. Haptic Glove;
- c. Virtual Reality Treadmill;
- d. Reaverse app.

These technologies aim to stimulate users' senses of sight, hearing, and touch, allowing them to virtually walk around Toraja, witness traditional events and customs, and even purchase souvenirs during their virtual travel. The purchased items will be delivered to users'

homes through a courier service. This idea is expected to revitalize the tourism sector that has been severely impacted by the pandemic. The key features of Reaverse include:

- a. Front Page: This page displays five main menu features, including the Top Destinations menu, Traditional Event Menu, Souvenir Snack Menu, and Information Menu.
- b. Top Destinations Menu: This menu recommends the best destinations in Toraja, providing historical information and stories related to each location.
- c. Traditional Events Menu: This menu showcases the traditional events that take place in Toraja, such as Rambu Solo, Rambu Toka, and Plunder Kapa'.
- d. Souvenir Snack Menu: Acting as an e-marketplace, this menu allows users to participate as either buyers or sellers of local micro, small, and medium-sized enterprise (MSME) products.
- e. Information Menu: This menu offers guidance on how to use the application, payment methods, and contact information.

The working principle of Reaverse involves the use of three hardware devices and one application:

- a. Oculus Headset: This device is worn on the user's head and is equipped with headphones, an LCD screen, and a microphone.
- b. Haptic Glove: This specialized glove provides haptic feedback, allowing users to feel virtual objects and enhancing the immersive experience.
- c. Virtual Reality Treadmill: The treadmill enables users to walk or move within the virtual environment, giving them a more realistic sense of exploration.
- d. Reaverse Application: This application serves as the platform for accessing and interacting with the virtual Toraja environment on the aforementioned hardware devices.

By integrating these technologies, Reaverse aims to create a compelling and immersive virtual tourism experience, ensuring Toraja remains a desirable destination, even in the face of challenges related to geographical constraints and the impact of the pandemic.



**Fig. 2.** Oculus Headset

Haptic Gloves enable users to experience a tactile and realistic interaction with virtual objects in the virtual world. This device functions as a user's hand and provides control over various actions. Haptic Gloves operate by utilizing sensors integrated into the glove, which can accurately measure the real-time position of each finger and the hand. When the Haptic Gloves detect contact with a virtual object, the actuators located at the back of the hand adjust the hand's position to generate precise tactile feedback.



**Fig. 3.** Haptic Glove [28]

The Virtual Reality Treadmill is the latest technology utilized, which enables users to experience the sensation of walking in a virtual world while maintaining a real-time connection with the physical environment. With this tool, users can explore and walk through various virtual landscapes without physically moving from their current location, ensuring the safety of the user during the running process. Additionally, the Virtual Reality Treadmill offers a more immersive walking and exploration experience, allowing tourists to virtually traverse the natural beauty and cultural richness of Toraja.



**Fig. 4.** Virtual Reality Treadmill [29]

In order to successfully achieve our objectives, it is imperative to foster collaboration and partnership with various stakeholders. The specific details and entities involved in this collaborative effort can be found in Table 1:

**Table 1.** Reverse Partner

No.	Related Companies/Institutions	Role
1.	Ministry of Tourism and Creative Economy	Act as supervisor to application Reverse and administrative permissions.
2.	Ministry of Foreign Affairs	His role is as a diplomat / socializer public and cultural information to foreign citizens regarding the utilization of platforms based on Virtual Reality for tourism.
3.	Ministry of Communication and Informatics	Play a role in optimizing the platform socialization process to all user social, from Indonesian society or especially foreign citizens.
4.	Ministry of Trade	Play a supervisory role, giver policies and permissions regarding the trading process in the application by utilizing 3D E-Commerce inside it use VR Technology.
5.	Ministry of Inventory /BKPM	Has a role as an information distributor and provider service investment from within the country or especially from abroad for program development.

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6.	tourism office South Sulawesi Province	Play a role in helping research process team, data input, and management platform in parts Toraja. Apart from that, it also plays a role in optimizing the process of socializing the platform to the public.
7.	Department of Communication and Information South Sulawesi Province	Play a role in optimizing the platform socialization process to all Indonesian people, especially the people of South Sulawesi Province.
8.	Department of Investment and Services One Stop Integrated Service (DPMPTSP) South Sulawesi Province	Has a role as an information distributor and provider service investment from within the country in particular from surrounding communities in South Sulawesi Province for program development.
9.	Babinsa (Village Guidance Officer)	Has a security role local, and provide guidance to the community regarding its importance contribute to this program.
10.	Local community	Act as a motivator community members to contribute together.
11.	Public	Has a role as Successor.
12.	Influencer	Play a role in optimizing the socialization process on social media by creating content that is unique and easily accepted so that more people will receive it interesting public attention and introduce it to society in a wider scope.
13.	META Company	Act as a supportive partner in procuring the goods/technology needed, namely Oculus Headset & Haptic Glove.
14.	KAT VR	Act as a supportive partner in procuring the goods/technology needed, namely VR Treadmill.
15.	Programmer	Play a role in analyzing requirements, designing & modeling systems, designing program code, debugging programs and testing programs.
16.	UI/UX Designer	Play a role in creating the appearance of the application Reaverse and determining how the application. can operate well, be easy to use, and be comfortable to use.
17.	Actors in Toraja	MSME actors will become providers product typical Toraja as souvenirs for tourists who have visited virtual travel.
18.	Goods Delivery Service Provider	Play a role in the distribution process of MSME products.
19.	Academics	Play a role in program monitoring and giving input towards the Reaverse program by analyzing and creating study.
20.	Media	Serves as a socialization platform from the Reaverse program to withdraw interest public local and interest from overseas people to use application this Reaverse.

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One of ways for Reaverse to be Agile and continue developing is by doing customer relationship marketing [30]. By general, its function is to create consumer comfortable towards a product so that consumers loyal to the product , always make purchases product over and over again which will result in a feeling of attachment, care from user will appears

and users will be more attentive to developments products, starting from even give advice could be an investor in the product we are. One of the strategy namely by giving discounts to customers. Reaverse also provides services publication advertisement product free of charge to MSMEs who partner with Reaverse.

## 5 Conclusions

Toraja as region situated in Indonesia, is renowned for its distinctive culture and breathtaking natural scenery. However, detrimental practices have exerted adverse impacts on the environment, local culture, and communities. These practices comprise the disrespectful treatment of local customs, cultural appropriation, environmental degradation, unregulated development, and insufficient support for the local economy. In the realm of tourism, accessibility holds paramount importance, necessitating robust transportation and infrastructure. The government plays a pivotal role in influencing tourists' choices through the provision of comprehensive supportive facilities and infrastructure. Nevertheless, road accessibility in Toraja poses a formidable challenge. In the year 2022, North Toraja Regency welcomed a total of 261,806 tourists, while Tana Toraja Regency received 480,631 tourists. The government is steadfast in allocating resources toward infrastructure development, encompassing the establishment and operation of Buntu Kunik Toraja Airport. The availability of infrastructure, encompassing transportation, telecommunications, sanitation, and energy, assumes critical significance for fostering economic growth and attracting investments. To foster responsible and sustainable tourism, collaborative efforts among tourists, the local community, and the government are imperative. Virtual Reality (VR) tourism holds potential in mitigating negative impacts by mitigating physical travel, enhancing tourist awareness, bolstering arrivals, and facilitating cultural development. Nonetheless, VR cannot fully substitute the tangible and sensory experience.

The collaboration of the Pentahelix sectors - community, government, mass media, law and regulation, academic, and business is indispensable in optimizing the tourism industry. Each component assumes a pivotal role in the development of appealing attractions, accessibility, amenities, and ancillary services. The tourist attractions in Toraja have not fully adapted to the changing market demands and necessitate a proactive approach from the tourism sector in terms of preparation and development of attractive attractions and robust tourism infrastructure. The accessibility of Tana Toraja Regency poses a challenge, mainly due to transportation infrastructure limitations, particularly in the advancement of the road network. The existing road infrastructure in Tana Toraja Regency comprises of 290.90 km of asphalt roads, 310.95 km of gravel roads, and 546.95 km of dirt roads. Unfortunately, approximately 74.25 percent of the total road length is subject to varying degrees of deterioration. The provision of amenities such as accommodation, food and beverage services, and other tourist facilities stands as integral factors in enhancing the appeal and sustainability of tourist destinations.

Virtual Reality (VR) technology has the potential to enhance tourist attractions in Toraja and attract a greater number of both local and foreign tourists. The Reaverse platform, powered by Meta Company and KAT VR technology, offers a comprehensive 360-degree experience of Toraja's tourist sites. This platform comprises various features, including Top Destinations, Traditional Events, Souvenir Snack Menu, and Information Menu. By utilizing devices such as the Oculus Headset, Haptic Glove, Virtual Reality Treadmill, and the

Reverse application, users can access a realistic 360-degree encounter, immersing themselves in the sights, sounds, and tactile experiences of Toraja. They can explore Toraja by walking through its surroundings, observing traditional events, and purchasing souvenirs, which can then be conveniently delivered to their homes. Responsible and sustainable practices in Toraja's tourism sector, including collaboration among the Pentahelix stakeholders, the development of captivating attractions and robust tourism infrastructure, and the utilization of technological innovations such as Virtual Reality, can yield significant benefits. The implementation of the Reverse platform, in particular, can elevate tourist attractions and stimulate the local economy. However, it is crucial for tourists, communities, and the government to collectively strive towards minimizing any negative impacts and promoting sustainable tourism.

## References

- [1] Aprilia, F., Kumadji, S., & Kusumawati, A. (2015). The Influence Of Word Of Mouth On Interest In Visiting And Its Impact On Decisions To
- [2] VISIT (Survey of Visitors to the "Jawa Timur Park 2" Tourist Attraction, Batu City). In *Journal of Business Administration (JAB)*|Vol (Vol. 24, Issue 1).
- [3] Cheong, R. (1995). *Utte Rwo Rth In Emann The virtual threat to travel and tourism* (Vol. 16, Issue 6).
- [4] Guttentag, D. A. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management*, 31(5), 637–651. <https://doi.org/10.1016/j.tourman.2009.07.003>
- [5] Khotimah Wilopo, K., Hakim, L., & Mathematics and Natural Sciences, F. (2017). Cultural Tourism Destination Development Strategy (Case
- [6] Study of the Trowulan Site Area as Leading Cultural Tourism in Mojokerto Regency) Faculty of Administrative Sciences 2). In *Journal of Business Administration (JAB)*|Vol (Vol. 41, Issue 1).
- [7] Kim, M. J., & Hall, C. M. (2019). A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors. *International Journal of Information Management*, 46, 236–249. <https://doi.org/10.1016/j.ijinfomgt.2018.11.016>
- [8] Lee, M., Lee, S.A., Jeong, M., & Oh, H. (2020). Quality of virtual reality and its impacts on behavioral intention. *International Journal of Hospitality Management*, 90. <https://doi.org/10.1016/j.ijhm.2020.102595>
- [9] Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions. *Journal of Destination Marketing and Management*, 2 (2), 118–127. <https://doi.org/10.1016/j.jdmm.2013.05.001>
- [10] Rauschnabel, PA, Ro, YK, Rauschnabel, PA, & Ro, YK (2016). Augmented reality smart glasses: an investigation of technology acceptance drivers. In *IEEE Transactions on Engineering Management* (Vol. 11, Issue 2). <http://www.philipp-rauschnabel.com>
- [11] Simanjuntak, C., Gede Leli Kusuma Dewi, L., & Gusti Ayu Susrami Dewi, N. (nd). Providing Accessibility For Tourists With Disabilities By Stakeholders In The Municipality Of Denpasar South Denpasar District.
- [12] Thirachaya Chaigasem, A., & Tunming Assistant Director, P. (2020). Tourist behaviors and needs for the development of creative Thai traditional sports tourism marketing for special interest tourism. In *African Journal of Hospitality, Tourism and Leisure* (Vol. 9, Issue 1). <http://www.ajhtl.com>
- [13] Tussyadiah, IP, Wang, D., Jung, TH, & Tom Dieck, MC (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management*, 66, 140–154. <https://doi.org/10.1016/j.tourman.2017.12.003/>
- [14] Wearing, S., & McDonald, M. (2002). The development of community-based tourism: Re-

thinking the relationship between tour operators and development agents as intermediaries in rural and isolated area communities. *Journal of Sustainable Tourism*, 10(3), 191–206. <https://doi.org/10.1080/09669580208667162>

- [15] Nailufar, Faza Dhora. 2023. "New Normal Life Strategy Through Local Indigenous Penta Helix Collaboration: Case Study Of." (May 2020):516–23. doi: 10.46254/au01.20220156.
- [16] Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Upper Saddle River, NJ: Pearson Education, Inc.
- [17] Adams, K.M. and Sandarupa, D. (2021), "Local Knowledge in Tourism Microentrepreneurship", Morais, D.B. (Ed.) *Tourism Microentrepreneurship (Bridging Tourism Theory and Practice, Vol. 12)*, Emerald Publishing Limited, Leeds, pp. 67-78. <https://doi.org/10.1108/S2042-144320210000012006>
- [18] Prawira, S. A., and D. Pralitasari. 2020. "The Influence of Accessibility, Innovation and Service Quality of Public Facilities on the Satisfaction of Disabled Passengers on the Jakarta Electric Railway." *Journal of the Indonesian College of Economics* 1– 15.
- [19] Itamar, H., Alam, S., & Rahmatullah. (2014). *Tourism Development Strategy in Tana Toraja Regency*. Government: *Journal of Government Studies*, 7(2), 91–108.
- [20] Patiroi, Andi. 2022. "Study of Road Safety Aspects of Regional Roads in Tana Toraja Regency to Support Economic and Tourism Activities." *Journal of Road Transportation Safety (Indonesian Journal of Road Safety)* 9(1):40–51. <https://doi.org/10.46447/ktj.v9i1.429>
- [21] Toraja, A. K. (2022, May 19). *Kareba Toraja*. Retrieved from Kareba Toraja Web site: <https://kareba-toraja.com/event-bisnis-wisata-toraja-carnaval-2022-resmi-dimulai/>
- [22] Rahmat, A. N. (2020, November 14). *Boosting Tourism, North Toraja Focuses on infrastructure development*. Newswire.
- [23] South, P. P. (2021). *Potential and Opportunities of Toraja Regency*.
- [24] Herawati. (2014). *Characteristics and Causes of Traffic Accidents in Indonesia in 2012*.
- [25] UNIKOM, M. (2023, July 4). *Synergy of the Pentahelix Model in Building the Regional Economy Using a Local Wisdom Approach in the Digital Era in Tana Toraja Regency, South Sulawesi*.
- [26] Matantu, Christine Elen. 2019. "Management of Lemo and Buntu Burake Tourist Attractions in Tana Toraja Regency, South Sulawesi Province." *Journal of Government Policy* 23–31. <https://doi.org/10.33701/jkp.v2i1.919>
- [27] Lambe, K. H. P., D. Gasong, and A. Toding. 2019. "Analysis of the Potential Development Model for Sarita Cloth (Maa') in Supporting Toraja Cultural Tourism Attractions." *Paul Journal of Society ...* 1(1):1–8.
- [28] haptx. (2023). *HaptX Gloves G1*. Retrieved from haptx.com: <https://haptx.com/> Menlnick, K. (2022, Desember 15). *The KAT Walk C 2 VR Treadmill Is Pretty Darn Cool*. Retrieved from vrscout.com: <https://vrscout.com/news/the-kat-walk-c-2-vr-treadmill-is-pretty-darn-cool/>
- [29] Menlnick, K. (2022, Desember 15). *The KAT Walk C 2 VR Treadmill Is Pretty Darn Cool*. Retrieved from vrscout.com: <https://vrscout.com/news/the-kat-walk-c-2-vr-treadmill-is-pretty-darn-cool/>
- [30] Hardilawati, W. laura. (2020). *MSME Survival Strategy in the Midst of the Covid-19 Pandemic*. *Journal of Accounting and Economics*, 10(1), 89-98. <https://doi.org/10.37859/jae.v10i1.1934>