



Ancient Java: Developing Digital Tourism Based On Virtual Reality For Promotion Media

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Abstract. The development of the tourism sector has an impact on the economic growth of each country. This happens because tourism has developed into one of the basic human needs. One form of tourism development to accommodate human needs is smart tourism development using Virtual Reality (VR). The utilization of technology in tourism will provide many benefits for stakeholders and tourists. The purpose of this research is to develop a virtual reality-based Ancient Java tourism application system as a tourism promotion in Java. The research method used is research and development (R&D) which uses the Borg & Gall model development. Data collection used qualitative instruments (interviews, observations, and documentation), as well as focus group discussions. The research data sources came from tourism stakeholders in East Java and Central Java, including the tourism office, tourist destination managers, investment and licensing offices, tourist agent entrepreneurs, and local communities in focus group discussions. The results showed that Ancient Java provides information about cultural tourism in the form of temples and sites in East Java and Central Java to tourists. The information provided is in the form of digital maps, a brief history of tourism, tourist locations, videos around tourist sites, street view and 360°. The development of the Virtual Reality-based Ancient Java tourism application system is expected to help relevant stakeholders in promoting tourist destinations through visual simulations such as the original form and can provide convenience for tourists in accessing the intended tourist information.

Keywords: tourism information system, tourism promotion strategy, Virtual Reality

1 Introduction

The tourism sector is an important component as a driver of economic growth in a world country (Lavrova & Plotnikov, 2018). As much as 10.4% of GDP in the world is generated from the tourism sector and 319 million jobs are supported by the tourism sector (Streimikiene et al., 2021). Tourism is a concern of the world community, which was originally considered a tertiary need, now it has become one of the main parts of the world community (Sharpley, 2020). This is related to the development of the modern world which requires humans to do activities and fulfill their daily needs, so that the availability of free time is decreasing. The existence of technological developments in the 4.0 era makes it easier for the tourism sector to innovate. One of them is the breakthrough in the use of technology and information or Smart Tourism (Um & Chung, 2021).

Technology utilization or smart tourism is used in the development of tourism innovation strategies. One of the uses of technology in tourism development is the use of Virtual Reality (VR). Virtual Reality offers an alternative way of using e-tourism that helps tourism stakeholders in promoting tourist destinations through visual simulations like the original form. So that the use of information technology makes it easier for tourists to reach tourist destinations (Li et al., 2021; Talwar et al., 2023). One example of an information system using technology that has been used previously as a tourism development strategy with GIS-based technology (Tukhliev et al., 2020), android (Kang & Jwa, 2018), web (Ke & Wu, 2020), and AR (Kaźmierczak et al., 2021). Some of the examples above show that technology is currently important in boosting the attractiveness of tourism destinations.

Indonesia has many tourist destinations that can be developed as the main destination. One of the 10 priority destinations for tourism development found throughout the archipelago. East Java and Central Java are included in the top 10 priorities for tourism development which have a lot of potential that can be developed as natural and cultural tourist destinations such as Bromo, Ijen, Prambanan, Rat Temple, Singosari Temple, Trowulan and other sites (Kristiana et al., 2020). Empirically, the development of tourism in Java, which has a significant contribution, is not supported by the development of smart tourism development (Kusuma, 2019). Therefore, a tourism development strategy is needed in East Java and Central Java, one of which is by utilizing VR-based technology (Nižetić et al., 2019).

The purpose of this research is to develop a virtual reality-based Ancient Java tourism application system as a tourism promotion in Java. The advantage of this product is the use of Virtual Reality (VR) based technology so that tourists feel directly and can interact with objects virtually and as if they are on a journey that is shown (Huang et al., 2022; Merks & Nawijn, 2021; Subawa et al., 2021). This is important because it can help tourists to feel more real to hard-to-reach destinations. In addition, it can help the Indonesian government as one of the strategies to promote temple tourism destinations and sites in East Java and Central Java to local and global markets.

The output of this research is a reputable international journal (Geojournal of Tourism and Geosites-Scopus Q1), IPR (granted), Implementation of agreement

(IoA), products in the form of VR-based virtual information system applications, and posters. All of these outputs are expected to support the achievement of the strategic business plan target of the State University of Malang Year 2022-2026. In addition, this research is included in applied research with Technology Readiness Level (TKT) 4, namely the manufacture of products in the form of tourism information systems and Katsinov 3.

2 Literature Review

2.1 Tourism

Tourism can increase foreign exchange earnings, create jobs, accelerate economic growth, and encourage various countries to develop the tourism sector (Kuncoroyekti et al., 2023; Nurhasan et al., 2023). Tourism contributed to global GDP by 10% in 2019 and is expected to increase to 50% in the next ten years (Kartiko, 2020). Indonesia with its natural wealth, culture and ancestral heritage has strategic tourism potential that needs to be maximized for the welfare of the community. Potential tourist destination areas must provide facilities, accessibility and attractiveness. In addition, in the next 5 years the government seeks to increase the cultural-based tourism sector and increase the tourism brand (Kusuma, 2019).

2.2 Tourism Development

The World Tourism Organization (UNWTO) defines tourism as a social, economic, and cultural phenomenon related to the movement of people to a country or place within or outside their living environment). The tourism sector continues to adapt to social issues and technological developments. Tourism development is very important in improving the Indonesian economy. Therefore, tourism development must be supported in various ways. This technology-related tourism sector is called Tourism 4.0. According to (Peceny et al., 2019). Tourism 4.0 basically aims to integrate all stakeholders, including local communities, tourists, tourism service providers and governments, in the field in a collaborative innovation process centered on local communities.

2.3 Tourism Promotion Strategy

A tourism promotion strategy is a planned step in order to achieve something desirable in delivering a tourism marketing message. Tourism promotion is very important for the image and reputation of all tourist destinations and can be a recommendation for incoming tourists (Florida-Benitez, 2022; Gore et al., 2021).

Promotion also plays an important role in tourism development because it involves efforts to communicate tourism potential to the target audience (Amin & Priansah, 2019). In order for tourism to be recognized by the wider community, an appropriate promotion strategy is needed so that tourism will develop. There are two kinds of promotion

strategies, namely direct and indirect. Tourism promotion strategies must consider various media and new ways to communicate with tourists. Participation from the government, community, stakeholders must occur so that tourism promotion is realized (Beriandaldo et al., 2021).

2.4 Tourism Information System

Tourism in its implementation certainly depends on the presence of tourists, so tourism promotion is very important. The creation of a tourist information system is very important to promote tourism (Lucas, 2019; Stelnik et al., 2019; Zhang, 2021). Information systems include organized steps to collect, enter, process and store data, as well as organized ways to store, manage, monitor and report (Saputra & Isnain, 2021). Three things should be prioritized when using tourism information systems, namely the quality of accessibility (convenient and sustainable) (De La Fuente-Robles et al., 2020), the quality of tourism information (schedules, opening hours, prices, weather and others) (Psaroudakis et al., 2021) and the capacity to customize the entire system (Scott et al., 2019). Information systems are considered important for several reasons, namely having benefits in providing decision making by considering the effectiveness of the tourism sector (Baranova, 2020). In addition, tourism information systems have benefits for tourism development in building environmental, socio-cultural, and economic systems (Balletto et al., 2020; Nyanga et al., 2019; Oliveira Moreira & Santos, 2020; Stankov & Gretzel, 2020).

2.5 Virtual Reality

Virtual Reality (VR) is a media and technological support tool for creative human activities in objectivity (Pernekulova et al., 2021). Virtual Reality (VR) can generally be defined as a virtual object in the real world into the virtual world, more precisely a 3D artificial simulation or recreation by providing an atmosphere of reality directly, especially involving the senses of sight, touch (touch) and hearing (Pernekulova et al., 2021). According to Hu et al. (2021), virtual reality has shown great potential in improving the tourism economy market and virtual reality allows its application in the Internet of Things (IoT). The impact of the implementation of virtual reality in this 3D model is easy to interact directly and allows all objects of tourism destinations to be visualized (Kowalski et al., 2020).

Virtual reality has developed significantly, from the 1960s to the 1970s it was widely used in medical and scientific research, but now virtual reality technology is starting to be commercialized. Virtual Reality (VR) is entering a period that is expected to have greater appeal to users and companies (Jean et al., 2021). Virtual reality has the benefit of providing new perspectives that can stimulate insight, promote more intuitive interactions, improve safety and save time and costs (de Freitas et al., 2022). The challenges facing virtual reality users are human factors, communication in the delivery of virtual reality, hardware and software (de Freitas et al., 2022; Lino et al., 2021; Wee et al., 2021).

3 Methodology

This research uses a type of research and development (R&D) that uses the Borg & Gall development model (Aka, 2019). Generally, the study was divided into two stages; the first stage was needs analysis through identification of potential tourism in East Java and Central Java. Primary data collection using qualitative instruments (interviews, observations, and documentation) at this stage (Siregar, 2021), data sources come from tourism stakeholders in East Java and Central Java which include the tourism office, tourist destination managers, investment and licensing offices, tour agent entrepreneurs, tourists and others. Local communities were also involved in the data collection process with focus group discussions.

The second stage is the development of a tourism information system with the help of virtual reality. This research and development uses seven stages of development according to research needs. The first stage is to analyze the potential for developing virtual reality-based tourism information system applications on the island of Java. The second stage is data collection and searching for information as application planning material through interviews, observation, and documentation. The third stage is to make application design development. The fourth stage is design validation by experts to assess the feasibility of the design and content of the application product. The fifth stage is design and product revision to make improvements based on the results of validation by experts before the application is tested. The sixth stage is the usage trial. The seventh stage is product revision of trial results. At this stage using the Borg & Gall stages which have 1-7 stages of research (Ningsih et al., 2019), with the following steps.

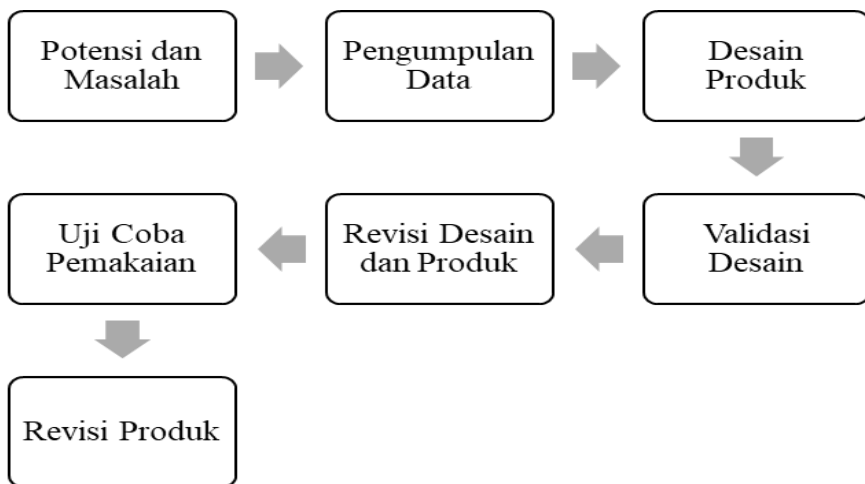


Fig. 1. Steps of the Borg & Gall Model

Table 1. Analysis Result Criteria of the Expedience of The Instrument Points

Percentage	Description
80-100	Very Good (No Revision)

66-79	Good (Need a few Revision)
56-65	Pretty Good (Partial Revision)
40-55	Not Good (Partial Revision and Reassessment of the Content)
0-39	Bad (Overall Revision/Change)

4 Result

4.1 Potential and Problems

East Java and Central Java are included in the top 10 tourism development priorities that have a lot of potential. However, the various tourism potentials are not supported by smart tourism development. In fact, smart tourism development is one of the tourism innovation strategies by utilizing technology that makes it easier for tourists to travel. (Nisa, 2022). One of the utilization of technology in tourism development is by using Virtual Reality (VR). Virtual Reality offers an alternative way of using e-tourism that helps tourism stakeholders in promoting tourist destinations through visual simulations like the original form. So that way tourists feel directly and can interact with objects virtually and as if they are on a journey that is shown. Ancient Java tourism application system based on virtual reality is a form of smart tourism development as a tourism promotion in Java. Ancient Java based on virtual reality contains temples and sites in East Java and Central Java which are expected to become virtual museums by providing various virtual tourist destinations, especially those in Java. So that the presence of Ancient Java based on virtual reality as a form of smart tourism development is expected to be a solution for related stakeholders and tourists in accessing tourist information in East Java and Central Java.

4.2 Problems Product Design

Information on the virtual reality-based Ancient Java tourism application includes information on temples and sites in East Java and Central Java. So that the presence of this application can facilitate tourists in accessing the information they want to go to. The following is presented information about the features contained in the Ancient Java tourism application.

Table 2. Analysis Result Criteria of the Expedience of The Instrument Points

No	Category	Features
1	Travel Map/Home	Displays all temples and sites on the island of Java with a total of 40 places displayed on a digital map with each place indicated by a pointer according to its original location.
2	Travel Destinations	Displays tourism destinations of all temples and sites on the island of Java which are equipped with temple and site information, address maps, images and videos that show the condition of the temple and its surroundings, as well as street view

& 360° so that tourists feel direct experience and can interact with objects virtually and as if they are on a journey that is shown.

The virtual reality-based Ancient Java tourism application system has two main features, namely the home page and a list of tourist destinations. The first feature is the home page that users first encounter when accessing Ancient Java. Home displays brief information about the Ancient Java application, a tourist map of temples and sites on the island of Java, and developer information. On the tourist map feature, there are special points or pointers made according to the coordinates of the tourist location. The pointer on each tourist location can be clicked and displays brief information about the tourist location. Tourist location information that appears on the pointer can be viewed further and completely by clicking "see details". In addition, on the initial or home page there is also a search feature on the initial or home page to facilitate users in finding the tourist location they want to go to, a brief feature that provides brief information about the Ancient Java application, a temple data feature that contains information about temples on the island of Java in this application, and an article feature. The second feature is a list of temple and site tourist destinations in Java Island with a total of 40 locations. This feature provides a complete list of tourist locations with each tourist location equipped with information about temple and site information, location address, images and videos that display the atmosphere around the tourist location, street view, and 360o. Information on temples and sites in this feature contains a brief description of the history, location, origin of naming, uniqueness, building structure, research results, and current condition of the temple and there are links that will direct users to see more information on the official district / city website or others. In this feature, there is also information about the nearest temple from one of the temple information accessed by the user. The street view and 360o features contained in the Ancient Java application can be used by users to travel virtually with the actual location conditions. In addition, users can also share information contained on this second feature page with others by clicking on the Facebook, Twitter, Telegram, and or WhatsApp icons.

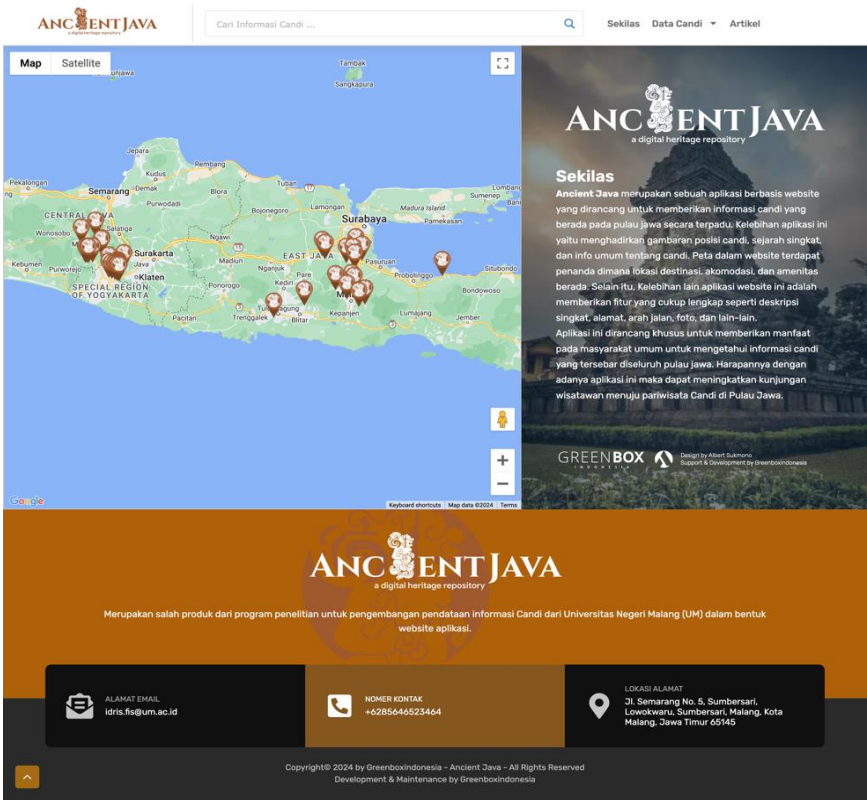


Fig. 2. Home Page

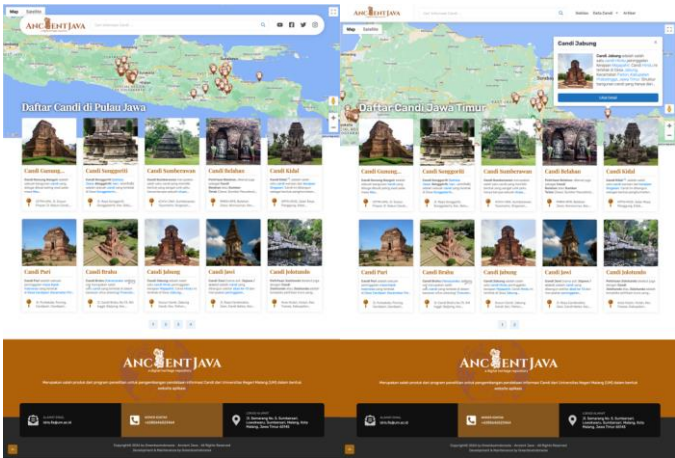


Fig. 3. Tourist Destination List Page and Tourist Location Pointer Information

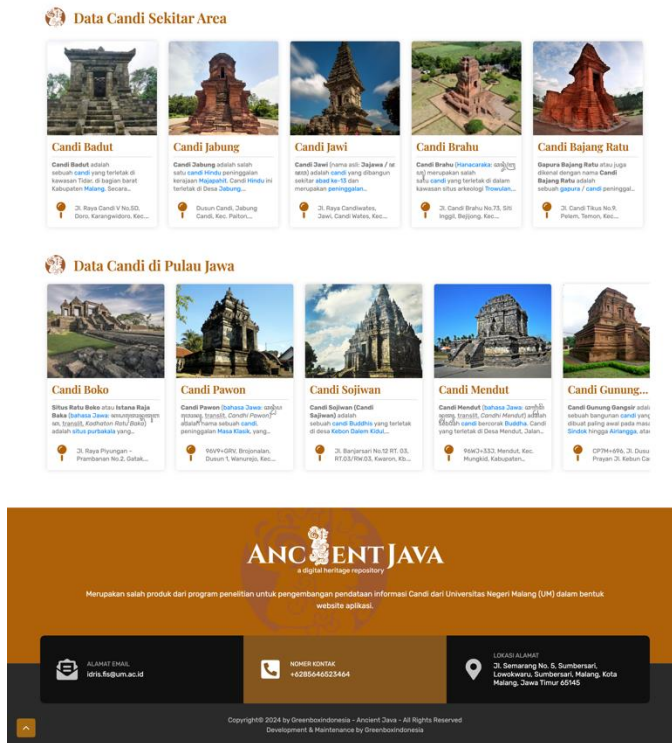


Fig. 4. Tourist Destination Detail Page

4.3 Product Development

The results of Ancient Java development show that the application results contain several categories that display temples and sites on the island of Java. On the main page, users can search for temples and sites that they want to go to. There are 40 locations of temples and sites on the island of Java that can be accessed by money users equipped with brief information about temples and sites, location addresses, images and videos that display the atmosphere around tourist sites, street view, and 360o. Not only that, the information on temples and sites in this feature contains a brief description of the history, location, origin of naming, uniqueness, building structure, research results, and current condition of the temple and there are links that will direct users to see more information on the official website of the district / city or others.

4.4 Product Validation

The development of Ancient Java application is also equipped with a product validation stage validated by media expert Neni Wahyuningtyas, M.Pd. Product validation is based on several aspects of measuring product feasibility including, system aspects,

user aspects, and interaction aspects listed in the form of instruments. So that the existence of product validation aims to assess whether or not the product is feasible to develop. Furthermore, to get better product validation results, product validation was carried out by linguist Agus Purnomo, M.Pd. Some aspects that must be assessed such as, physical size, logo design, typography of application content, content illustrations, application content layout, and cover typography. The results of the validation show that the Ancient Java application product based on virtual reality is feasible to be developed and implemented. The Ancient Java product validation rating scale uses a Likert scale with a range of 1-5 (1 = Not Good, 2 = Less Good, 3 = Quite Good, 4 = Good, 5 = Very Good). The validation results obtained are depicted in diagram form in Figures 4 and 5.

The results of product validation that have been obtained from media and language experts show that Ancient Java application products based on virtual reality are in the very good category. Media validation results obtained on system features 93%, user features 96%, and interaction features 96% (Figure 4). While language validation obtained physical performant indicators 80%, logo design 87%, cover typography 100%, content illustration 94%, app content layout 100%, and content typography 100% (Figure 5). Based on the acquisition of overall validation indicators, in general, the products developed fall into the excellent category.

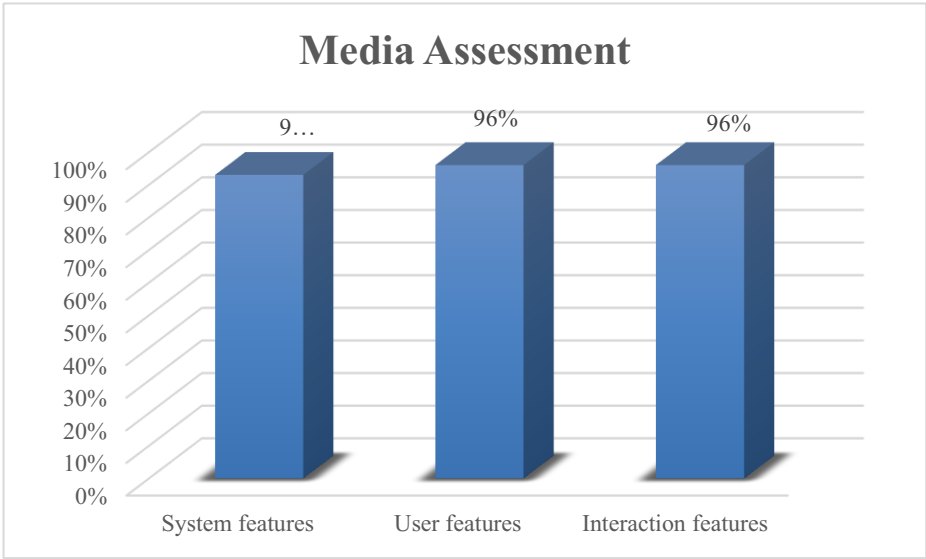


Fig. 5. Media Validation

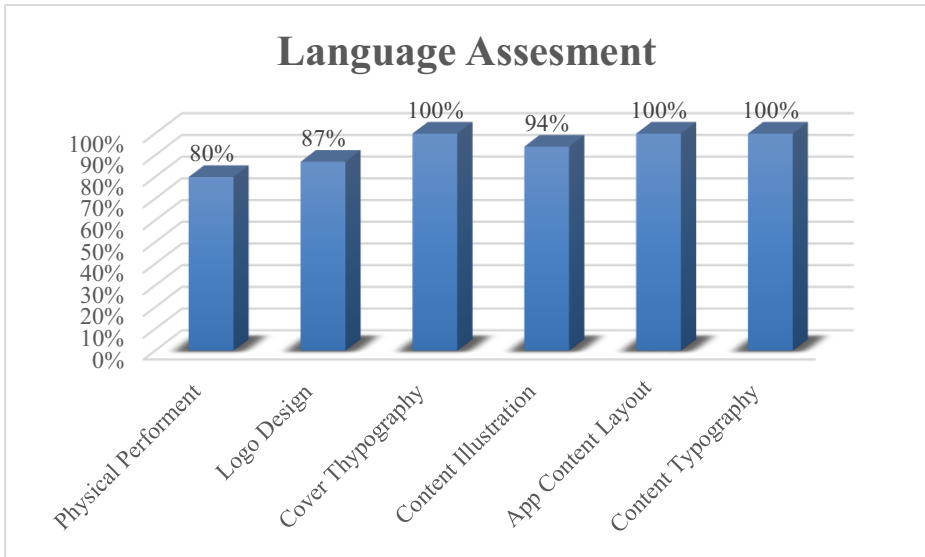


Fig. 6. Language Validation

5 Discussion

Current technological developments make it easy for the tourism sector to innovate. One of the utilization of technology in the tourism sector is the use of Virtual Reality (VR). Virtual Reality is a media and technological support tool for creative human activities in its objectivity. (Pernekulova et al., 2021). Virtual Reality (VR) can generally be defined as a virtual object in the real world into the virtual world, more precisely a simulation or artificial recreation in 3D form by providing an atmosphere of reality directly, especially involving the senses of sight, touch (touch) and hearing (Hoang et al., 2023). The existence of virtual reality shows great potential in increasing the tourism economy market and virtual reality allows its application in the Internet of Things (IoT). The impact of the implementation of virtual reality in this 3D model is easy to interact directly and allows all objects of tourism destinations to be visualized (Kowalski et al., 2020).

Virtual reality is expected to have a greater appeal to both users and companies (Jean et al., 2021). Currently, virtual reality is widely used to provide destinations, promotional media, attractions, improve tourism experiences, form interesting experiences for tourists, and generate new tourism models (Calisto & Sarkar, 2024). With its ability to create new experiences, it can certainly change the way tourists plan and enjoy travel (De Luca et al., 2022). Through Virtual Reality, tourists will get an immersive experience that will take tourists to distant destinations without having to leave home and save costs (Hoang et al., 2023). So that tourists can feel and interact directly virtually as if they are traveling (Huang et al., 2022; Merx & Nawijn, 2021; Subawa et al., 2021).

Development of tourism application system "Ancient Java" based on Virtual Reality as one of the efforts to provide a real experience for tourists. Tourists can interact directly in cultural tourism in the form of temples and sites on the island of Java, especially East Java and Central Java. In addition to providing a real experience for tourists, the development of this application can also help the Indonesian government as one of the strategies for promoting temple tourism destinations and sites in East Java and Central Java to local and global markets. Ancient Java can be accessed easily and practically through the website. The features displayed will show a complete tourist location with each tourist location equipped with information about temple and site information, location address, images and videos that display the atmosphere around the tourist location, street view, and 360o. The use of Ancient Java based on Virtual Reality shows that the importance of using technology that continues to affect many sectors, one of which is the tourism sector.

6 Conclusion

Ancient Java based on virtual reality contains information about temples and sites in East Java and Central Java. There are 40 temples and sites that are equipped with temple and site information, address maps, images and videos that show the condition of the temple and its surroundings, as well as street view & 360° so that tourists feel direct experience and can interact with objects virtually and as if they are on a journey that is shown. Information on temples and sites in this feature contains a brief description of the history, location, origin of naming, uniqueness, building structure, research results, and current condition of the temple and there is a link that will direct users to see further information on the official district / city or other websites. Based on the acquisition of overall validation indicators, in general, Ancient Java application products based on virtual reality are worth developing and fall into the excellent category.

Reference

1. Aka, K. A. (2019). Integration Borg & Gall (1983) and Lee & Owen (2004) models as an alternative model of design-based research of interactive multimedia in elementary school. *Journal of Physics: Conference Series*, 1318(1), 012022. <https://doi.org/10.1088/1742-6596/1318/1/012022>
2. Amin, M. A. S., & Priansah, P. (2019). Marketing Communication Strategy To Improve Tourism Potential. *Budapest International Research and Critics Institute (BIRCI-Journal) : Humanities and Social Sciences*, 2(4), 160–166. <https://doi.org/10.33258/birci.v2i4.575>
3. Balletto, G., Milesi, A., Ladu, M., & Borruso, G. (2020). A Dashboard for Supporting Slow Tourism in Green Infrastructures. A Methodological Proposal in Sardinia (Italy). *Sustainability*, 12(9), 3579. <https://doi.org/10.3390/su12093579>
4. Baranova, V. (2020). Information System for Decision Support in the Field of Tourism Based on the Use of Spatio-Temporal Data Analysis. *International Journal of Advanced*

- Trends in Computer Science and Engineering*, 9(4), 6356–6361. <https://doi.org/10.30534/ijatcse/2020/317942020>
5. Berliandaldo, M., Chodiq, A., & Fryantoni, D. (2021). Kolaborasi dan Sinergitas Antar Stakeholder dalam Pembangunan Berkelanjutan Sektor Pariwisata Di Kebun Raya Cibinong. *INOBI: Jurnal Inovasi Bisnis Dan Manajemen Indonesia*, 4(2), 221–234.
 6. Calisto, M. de L., & Sarkar, S. (2024). A systematic review of virtual reality in tourism and hospitality: The known and the paths to follow. *International Journal of Hospitality Management*, 116. <https://doi.org/10.1016/j.ijhm.2023.103623>
 7. de Freitas, F. V., Gomes, M. V. M., & Winkler, I. (2022). Benefits and Challenges of Virtual-Reality-Based Industrial Usability Testing and Design Reviews: A Patents Landscape and Literature Review. *Applied Sciences*, 12(3), 1755. <https://doi.org/10.3390/app12031755>
 8. De La Fuente-Robles, Y. M., Muñoz-de-Dios, M. D., Mudarra-Fernández, A. B., & Ricoy-Cano, A. J. (2020). Understanding stakeholder attitudes, needs and trends in accessible tourism: A systematic review of qualitative studies. *Sustainability*, 12(24), 1–23.
 9. De Luca, V., Marcantonio, G., Barba, M. C., & De Paolis, L. T. (2022). A Virtual Tour for the Promotion of Tourism of the City of Bari. *Information*, 13(7), 339.
 10. Florido-Benítez, L. (2022). The impact of tourism promotion in tourist destinations: a bibliometric study. *International Journal of Tourism Cities*, 8(4), 844–882. <https://doi.org/10.1108/IJTC-09-2021-0191>
 11. Gore, S., Borde, N., & Hegde Desai, P. (2021). Assessment of technology strategies for sustainable tourism planning. *Foresight*, 23(2), 172–187. <https://doi.org/10.1108/FS-02-2020-0006>
 12. Hoang, S. D., Dey, S. K., Tučková, Z., & Pham, T. P. (2023). Harnessing the power of virtual reality: Enhancing telepresence and inspiring sustainable travel intentions in the tourism industry. *Technology in Society*, 75. <https://doi.org/10.1016/j.techsoc.2023.102378>
 13. Hu, M., Luo, X., Chen, J., Lee, Y. C., Zhou, Y., & Wu, D. (2021). Virtual reality: A survey of enabling technologies and its applications in IoT. *Journal of Network and Computer Applications*, 178, 102970. <https://doi.org/10.1016/j.jnca.2020.102970>
 14. Huang, C., Zhang, W., & Xue, L. (2022). Virtual reality scene modeling in the context of Internet of Things. *Alexandria Engineering Journal*, 61(8), 5949–5958. <https://doi.org/10.1016/j.aej.2021.11.022>
 15. Jean, W. C., Britz, G. W., DiMeco, F., Elmi-Terander, A., & McIntyre, C. (2021). Introduction. Virtual and augmented reality in neurosurgery: a timeline. *Neurosurgical Focus*, 51(2). <https://doi.org/10.3171/2021.5.FOCUS21313>
 16. Kang, H., & Jwa, J. (2018). Development of android based smart tourism application based on tourism bigdata analytics. *Journal of Engineering and Applied Sciences*, 13(5), 1164–1169.
 17. Kartiko, N. D. (2020). Insentif Pajak Dalam Merespons Dampak Pandemi Covid-19 Pada Sektor Pariwisata. *Jurnal Pajak Dan Keuangan Negara (PKN)*, 2(1), 124–137. <https://doi.org/10.31092/jpkn.v2i1.1008>
 18. Kaźmierczak, R., Szczepańska, A., Kowalczyk, C., Grunwald, G., & Janowski, A. (2021). Using AR Technology in Tourism Based on the Example of Maritime Educational Trips—A Conceptual Model. *Sustainability*, 13(13), 7172. <https://doi.org/10.3390/su13137172>
 19. Ke, M., & Wu, L. (2020). Development and Realization of Web - Based Tourism Service Platform. *IOP Conference Series: Materials Science and Engineering*, 750(1), 012056. <https://doi.org/10.1088/1757-899X/750/1/012056>
 20. Kowalski, S., Samól, P., Szczepański, J., & Dłubakowski, W. (2020). Teaching architectural history through virtual reality. *World Transactions on Engineering and Technology Education*, 18, 197–202.

21. Kristiana, Y., Pramono, R., Nathalia, T. C., Adato, V., & Goeltom, H. (2020). Tourism and Original Local Government Revenue in Indonesia Tourism Provinces: The Java Island Experience. *Systematic Reviews in Pharmacy*, 11(9), 745–750.
22. Kuncoroyekti, H., Purnomo, V. D., Handoyo, B. H. C., & Kadir, S. A. (2023). Expanding the Potential of Tourism in Indonesia through the Digital and Creative Economy in Concern to Sustainable Development. *Jurnal Sosial, Politik Dan Budaya (SOSPOLBUD)*, 2(1), 179–188. <https://doi.org/10.55927/sospolbud.v2i1.2709>
23. Kusuma, C. S. D. (2019). MICE- Masa Depan Bisnis Pariwisata Indonesia. *Efisiensi - Kajian Ilmu Administrasi*, 16(2), 52–62. <https://doi.org/10.21831/efisiensi.v16i2.27420>
24. Lavrova, T., & Plotnikov, V. (2018). The development of tourism: the experience of Russia. *MATEC Web of Conferences*, 170, 01028. <https://doi.org/10.1051/matec-conf/201817001028>
25. Li, Y., Song, H., & Guo, R. (2021). A Study on the Causal Process of Virtual Reality Tourism and Its Attributes in Terms of Their Effects on Subjective Well-Being during COVID-19. *International Journal of Environmental Research and Public Health*, 18(3), 1019. <https://doi.org/10.3390/ijerph18031019>
26. Lino, F., Arcangeli, V., & Chieffo, D. P. R. (2021). The Virtual Challenge: Virtual Reality Tools for Intervention in Children with Developmental Coordination Disorder. *Children*, 8(4), 270. <https://doi.org/10.3390/children8040270>
27. Lucas, L. (2019). The ordinary – extraordinary dialectics in tourist metropolises. *International Journal of Tourism Cities*, 5(1), 17–34. <https://doi.org/10.1108/IJTC-12-2017-0082>
28. Merckx, C., & Nawijn, J. (2021). Virtual reality tourism experiences: Addiction and isolation. *Tourism Management*, 87, 104394. <https://doi.org/10.1016/j.tourman.2021.104394>
29. Ningsih, L. R., Miarsyah, M., & Rusdi, R. (2019). Interactive media of respiratory system material “resysmart” based on problem-based learning. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 5(3), 459–470. <https://doi.org/10.22219/jpbi.v5i3.7807>
30. Nisa, F. L. (2022). Pengembangan Wisata Halal Di Jawa Timur Dengan Konsep Smart Tourism. *Ar Rehla: Journal of Islamic Tourism, Halal Food, Islamic Traveling, and Creative Economy*, 2(1), 13–26.
31. Nžetić, S., Džilali, N., Papadopoulos, A., & Rodrigues, J. J. P. C. (2019). Smart technologies for promotion of energy efficiency, utilization of sustainable resources and waste management. *Journal of Cleaner Production*, 231, 565–591. <https://doi.org/10.1016/j.jclepro.2019.04.397>
32. Nurhasan, A. T., Rahmatia, R., & Fitrianti, R. (2023). Analisis Pengaruh Perkembangan Sektor Pariwisata Pesisir Terhadap PAD Melalui Pertumbuhan Ekonomi di Sulawesi Barat. *Economics and Digital Business Review*, 4(1), 708–719.
33. Nyanga, C., Pansiri, J., & Chatibura, D. (2019). Enhancing competitiveness in the tourism industry through the use of business intelligence: a literature review. *Journal of Tourism Futures*, 6(2), 139–151. <https://doi.org/10.1108/JTF-11-2018-0069>
34. Oliveira Moreira, C., & Santos, N. (2020). Tourism Qualitative Forecasting Scenario Building Through The Delphi Technique. *Cuadernos de Turismo*, 46, 423–457. <https://doi.org/10.6018/turismo.451911>
35. Peceny, U. S., Urbančič, J., Mokorel, S., Kuralt, V., & Ilijaš, T. (2019). Tourism 4.0: Challenges in marketing a paradigm shift. In *Consumer behavior and marketing*. IntechOpen.
36. Pernekulova, M. M., Sagikyzy, A., Ashirbekova, Z. B., Zhanabayeva, D. M., & Abdurazakova, G. A. (2021). Definition of virtual reality through creative act. *Academic Journal of Interdisciplinary Studies*, 10(2), 176–184.
37. Psaroudakis, C., Xanthopoulos, G., Stavrakoudis, D., Barnias, A., Varela, V., Gkotsis, I., Karvouniari, A., Agorgianitis, S., Chasiotis, I., Vlachogiannis, D., Sfetsos, A., Kaoukis, K.,

- Christopoulou, A., Antakis, P., & Gitas, I. Z. (2021). Development of an Early Warning and Incident Response System for the Protection of Visitors from Natural Hazards in Important Outdoor Sites in Greece. *Sustainability*, 13(9), 5143. <https://doi.org/10.3390/su13095143>
38. Saputra, M. A., & Isnain, A. R. (2021). Penerapan Smart Village Dalam Peningkatan Pelayanan Masyarakat Menggunakan Metode Web Engeneering (Studi Kasus: Desa Sukanegeri Jaya). *Jurnal Teknologi Dan Sistem Informasi*, 2(3), 49–55.
 39. Scott, D., Steiger, R., Rutty, M., Pons, M., & Johnson, P. (2019). The differential futures of ski tourism in Ontario (Canada) under climate change: the limits of snowmaking adaptation. *Current Issues in Tourism*, 22(11), 1327–1342. <https://doi.org/10.1080/13683500.2017.1401984>
 40. Sharpley, R. (2020). Tourism, sustainable development and the theoretical divide: 20 years on. *Journal of Sustainable Tourism*, 28(11), 1932–1946. <https://doi.org/10.1080/09669582.2020.1779732>
 41. Siregar, A. A. (2021). Pengelolaan Pariwisata Warisan Budaya Di Kawasan Istana Asserayah Al-Hasyimiah Kabupaten Siak Provinsi Riau. *EDUTOURISM Journal Of Tourism Research*, 3(01), 76–89. <https://doi.org/10.53050/ejtr.v3i01.173>
 42. Stankov, U., & Gretzel, U. (2020). Tourism 4.0 technologies and tourist experiences: a human-centered design perspective. *Information Technology & Tourism*, 22(3), 477–488. <https://doi.org/10.1007/s40558-020-00186-y>
 43. Stelnik, E. V., Kiyashko, Y. A., & Lysikov, P. I. (2019). Information technology in the digital document management in the tourism industry as a perspective tool in increasing effectiveness of a tourist enterprise. *IOP Conference Series: Materials Science and Engineering*, 483(1), 012062.
 44. Streimikiene, D., Svagzdiene, B., Jasinskas, E., & Simanavicius, A. (2021). Sustainable tourism development and competitiveness: The systematic literature review. *Sustainable Development*, 29(1), 259–271. <https://doi.org/10.1002/sd.2133>
 45. Subawa, N. S., Widhiasthini, N. W., Astawa, I. P., Dwiatmadja, C., & Permatasari, N. P. I. (2021). The practices of virtual reality marketing in the tourism sector, a case study of Bali, Indonesia. *Current Issues in Tourism*, 24(23), 3284–3295. <https://doi.org/10.1080/13683500.2020.1870940>
 46. Talwar, S., Kaur, P., Nunkoo, R., & Dhir, A. (2023). Digitalization and sustainability: virtual reality tourism in a post pandemic world. *Journal of Sustainable Tourism*, 31(11), 2564–2591. <https://doi.org/10.1080/09669582.2022.2029870>
 47. Tukhliev, I. S., Abdukhmidov, S. A., & Muhamadiev, A. N. (2020). Features of the use of digital technology in the development of geographic information systems in tourism. *Journal of Advanced Research in Dynamical and Control Systems*, 12(7 Special Issue), 2206–2208.
 48. Um, T., & Chung, N. (2021). Does smart tourism technology matter? Lessons from three smart tourism cities in South Korea. *Asia Pacific Journal of Tourism Research*, 26(4), 396–414.
 49. Wee, C., Yap, K. M., & Lim, W. N. (2021). Haptic Interfaces for Virtual Reality: Challenges and Research Directions. *IEEE Access*, 9, 112145–112162. <https://doi.org/10.1109/ACCESS.2021.3103598>
 50. Zhang, X. (2021). RETRACTED ARTICLE: Characteristics of mountain climate change and optimization of agricultural tourism management based on satellite Internet of Things. *Arabian Journal of Geosciences*, 14(16), 1625. <https://doi.org/10.1007/s12517-021-07708-w>

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