International Journal of Geotourism Science and Development (IJGSD)
Vol.3 Issue 02, Dec 2023, pp: 51-62
ISSN: 2985-3575 (print) |ISSN: 2964-3481 (online)
DOI: https://doi.org/10.58856/ijgsd.v3i2.30

Gamification of Indonesia Geospatial Data as An Advanced and Sustainable Digital Geotourism Media

Adnan Hasyim Wibowo[1], Ralfy Ruben Rialdi [2]
[1,2] University of Indonesia

Article Info

Article history:
Received Aug 19, 2023
Revised Sept 22, 2023
Accepted Nov 25, 2023

Keywords:
Gamification, Geospatial Data, Digital Geotourism Media,

ABSTRACT

Easier internet access makes space and time boundaries in the real world no longer significant challenges in the virtual world. This means that tourists do not always have to physically visit the places they want. Digital tourism has become a new realm that is positively growing in the current era. Unfortunately, even though this is in great demand in various parts of the world, Indonesia is still not fully exploiting (in positive terms) this potential. Geospatial data and technology can be the primary key in solving these problems and opening broader development potential although data utilization and optimization of existing geospatial technology still need improvement. The various existing innovations are still relatively conventional and do not attract youngsters' attention. An advanced but fun project is, therefore, needed to bridge geospatial experts, creative innovators, and the youth to develop and accelerate digital tourism in Indonesia. Gamification is a promising solution to this problem. This research uses the 4D method (define, design, develop, disseminate). The gamification resulting from the 4D method is used by researchers as an instrument to compare with conventional tourism media to determine public interest and promotional reach for traveling to Indonesia. The primary data used in this project is the Indonesia Shuttle Radar Topography Mission (SRTM) data. The first part of the results discusses the gamification model that the researchers propose. This model uses Minecraft as a basis for gamification in implementing the exploitable open-world concept. The second part of the results discusses the validation and potential of the gamification that the researchers created through the triangulation of survey data, interviews, and literature.

This is an open access article under the CC BY-SA license.

Corresponding Author:
Adnan Hasyim Wibowo
Email:

1. INTRODUCTION

Providing long-life learning opportunities for all parties, supporting inclusive industrialization, and revitalizing the global partnership for sustainable development are some of the things that are crucial for us to pay attention in actualizing the goals we have formulated (Calabrese et al., 2021). Some things can significantly influence and give a domino effect to produce exponentially sustainable development achievements, but they are still relatively unnoticed. The tourism sector is the leading actor in this challenge. Easier internet access makes space and time boundaries in the real world no longer have a significant meaning in the virtual world. This means that tourism does not always have to be done by physically visiting the place we want. Digital tourism has become a new realm that is positively overgrowing in the current era. Unfortunately, even though this is very in demand in various parts of the world, Indonesia and

the Southeast Asian region are still not fully exploiting (in positive terms) the potential of digital tourism (Nee, 2023). Even Indonesia's involvement in digital tourism practices is still not optimal because most of the programs are still too focused on conventional tourism conservation.

Another thing that could be improved in the inclusive industrialization process in the ASEAN region is related to the learning process, which is still relatively conventional. Learning that still emphasizes exam results rather than practice from the knowledge that has been learned is one of the fundamental problems in the education sector in ASEAN, especially in Indonesia (Tejomurti & Hermawan, 2022). One of the concrete shreds of evidence connected to this is related to the aspect of spatial intelligence in Indonesian society. This is a sad irony because, during global development, we are experiencing a decline in our innate abilities. One of the reasons for this condition is the degradation of the mental map of Indonesian society, especially among students (Purwanto & Harani, 2020).

The ease of internet access makes it easy to access many things non-physically. On the other hand, this also causes many students to be reluctant to learn many things physically. Exploring nature with the aim of knowledge is something that is increasingly less attractive to youth today. Geospatial data and technology can be the primary key that solves these problems and opens broader development potential. Unfortunately, data utilization and optimization of existing geospatial technology still need improvement.

The various innovations that exist are still relatively conventional and do not attract the younger generation's attention. Because of this, an advanced but fun project is needed to bridge geospatial experts, creative innovators, and the youth to develop digital tourism media and improve existing mental map learning tools. Gamification is one of the potentials but promising solutions to this problem.

Gamification is a concept that packages something complex and usually tends to be boring into a thing (Panis et al., 2020). Gamification has been widely applied to many things, such as increasing productivity or explaining something complicated to increase interest in and understanding of learning material. The gamification of something is usually associated with games that many people already know or have been popular recently (Luo, 2022). Minecraft is a game option widely used as a gamification medium. Its popularity, supported by its creative community, gives Minecraft unlimited exploration potential. Minecraft, which has a feature to create maps based on our imagination and creativity, allows players to duplicate various landscapes that exist in real life.

Based on these things, the author are interested in gamifying the Indonesia geospatial data as an advanced and sustainable geotourism media through Minecraft..

2. METHODS

This paper is mixed research that applies the 4D method (Define, Design, Develop, Disseminate). The 4D stages that the author apply in this paper are described as follows:
(1) Define, the author conduct a literature study and analysis of various previous studies and projects to produce gamification of GIS data;
(2) Design, the author arranges a recreate map design that will be made by going through a criterion test process (comparing the test), media selection (determining the application to be used), format selection (selection of the form of displaying the results), and initial design (preliminary design);
(3) Develop, the author make corrections and validations on the maps that have been recreated to be tested for dissemination on an initial scale; and
(4) Dissemination, the author try to apply geospatial data that has been gamified as a digital geotourism medium to target international respondent from various levels.

The process of designing Indonesian geographic data gamification also applies the method of literature study and online surveys to support the 4D development model that will be carried out. The author conducted a literature study to collect existing geospatial data for later reduction and retrieve relevant digital elevation model (DEM) data for gamification.

The author then surveyed 50 participants from various level of education around the world. This survey was conducted online by the author to obtain data on interest in Indonesian tourism and the desire to visit Indonesia from participants after trying to play the gamification that the author had created. The instrument that the author uses in this method is the g-form which contains objective questions in the form of multiple choices.

The data that has been obtained is then processed by the author with several methods. The author's gamification data is processed through scaling methods, brush settings, adjustments to geological features, and overlaying images.
While the data from the survey results were processed by using the normal test and correlation test as well as different tests. The normal test that the author use in this paper the normal Shapiro-Wilk test, and the correlation test that the author use is the Pearson correlation test while the different tests the author perform by applying a paired t-test.

The author's normal test is done to find out whether the distribution of the survey data that the author gets is normally distributed or not. Then the author did a correlation test to find out the relationship between interest in geotourism in Indonesia and participants' desire to visit Indonesia. Apart from that, the author also applies a feasibility assessment framework to validate the gamification that the author has created and analyzes the potential and feasibility for implementing this gamification in the realm of online geotourism in Indonesia.

3. RESULT AND DISCUSSION

The primary data that the author use is the Shuttle Radar Topography Mission (SRTM) data which maps the topography of an area using radar and contains information on the elevation of the area, also known as the Digital Elevation Model (DEM). DEM data is geospatial data representing the height or elevation of a surface on Earth. The main advantage of DEM data is its ability to provide accurate and detailed topographical information.

This is very useful in the gamification of geospatial information systems because DEM data can be used to display the topography of an area visually, which is more attractive and makes it easier for users to understand. Apart from that, DEM data can also be used to calculate distances, calculate volumes, and perform other spatial analyses which will be useful in gamification applications. Using DEM SRTM 3 arc-second global coverage or a resolution about 90 meters, DEM SRTM with this resolution has results that look smoother than DEM SRTM with 30 meters resolution due to downsampling operations on DEM SRTM 3 arc-second global coverage using the average operating kernel as a low pass filter. This 30-degree x 30-degree data with a significant vertical error of fewer than 16 meters was obtained from CGIAR-CSI GeoPortal with the latest interpolation algorithm. We also used Landsat 8-9 OLI/TIRS Collection 2 Level-1 land cover maps obtained from the USGS Earth Explorer to correct the data and further detail for the resulting gamification. This land cover map data will also be a valid instrument for Geographic Information System (GIS) gamification.

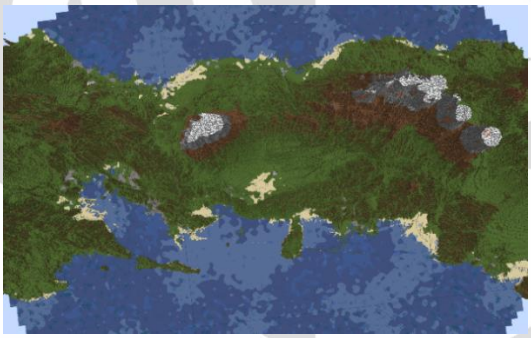
The author chose to use MicroDEM because this software is specifically designed to process DEM data. This software can process DEM data from various formats such as ASCII, BIL, BIP, and so on into a Tagged Image File (TIF) format. This DEM SRTM data covers the entire topography of the Earth's surface with a latitude of about 60 North Latitude/South Latitude. SRTM data will go through a data thinning process using the thin (decimate) feature to reduce the amount of data by only storing a few Nth points from each axis, where N is an integer from DEM data which will then be stored in TIF format using MicroDEM application.

Data in TIF format will then be converted into a world in Minecraft using the WorldPainter application version 2.15.15. Data processing in the WorldPainter application aims to adjust the height data from the SRTM file with the height range in the Minecraft system, namely Ymaximum = 319 blocks and Yminimum

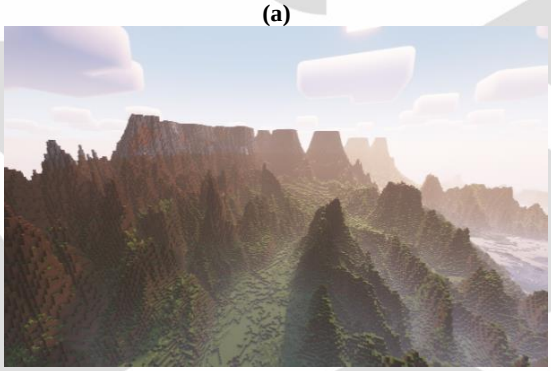
International Journal of Geotourism Science and Development (IJGSD)
Vol.3 Issue 02, Dec 2023, pp: 51-62
ISSN: 2985-3575 (print) |ISSN: 2964-3481 (online)
DOI: https://doi.org/10.58856/ijgsd.v3i2.30

= -64 blocks. One of the primary uses of MicroDEM applications is to convert DEM data into TIF format. The TIF format is a standard format often used in geospatial applications, so processing DEM data in TIF format will make it easier to use and process this data in other applications.

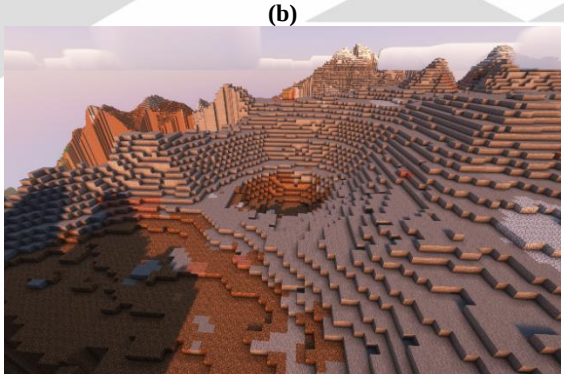
In addition, the TIF format also has high compression, so the resulting file size is smaller than the original format, making it easier to store and send. In addition, the MicroDem application also can filter DEM data. This filtering process is beneficial for eliminating noise or interference in DEM data so that the resulting data is more accurate and detailed. The MicroDEM application also can display DEM data in a more attractive visual form. This software can display DEM data in a topographic map that provides more precise information about an area's elevation, relief, and topography. The author utilized MicroDEM in this paper to combine DEM data, especially DEM data from the Standard Map and data thinning. The data processed using the MicroDEM application will produce an output file in the TIF format.The author is also using WorldPainter 2.15.15, an app that works as an interactive Minecraft map generator. This application allows users to "paint" landscapes using tools similar to a regular painting program. The WorldPainter application also allows users to modify Minecraft map features such as terrain and biome types. In this project, the author utilizes the WorldPainter feature to implement real-world terrain conditions by leveraging SRTM DEM data into the Minecraft game.



(a)



(b)



(c)

Figure 1. Display example of geospatial data gamification results that the author has made in Minecraft.

The Minecraft map generated from the WorldPainter application can then be played in the Minecraft application with features according to the settings that have been made.

Initial Dissemination Survey Result

In this paper, a normality test was carried out using the Shapiro-Wilk method on online survey data aimed at 50 international respondents with various levels of education. The survey aims to analyze respondents' interest in Indonesia geotourism and respondents' desire to visit Indonesia physically or directly after trying the results of geospatial data gamification in Minecraft. The normality of the data then assessed using the Shapiro-Wilk test.

The results of the interest test showed that the p-value obtained was 0.17581, indicating that there was no significant departure from normality in the distribution of respondents' interest in geotourism in Indonesia after experiencing the gamified geospatial data in Minecraft. The participants were asked to rate their interest in geotourism in Indonesia on a scale of 1 to 6, where a score of 1 indicated very little interest and a score of 6 denoted high interest. The use of gamified geospatial data in Minecraft was intended to enhance the respondents' engagement and understanding of geotourism in Indonesia. The obtained p-value of 0.17581, which is greater than the commonly used significance level of 0.05, suggests that the null hypothesis of normality cannot be rejected.

Therefore, it can be concluded that the data of respondents' interest in geotourism follows a normal distribution. By demonstrating that the data follows a normal distribution, the author can have increased confidence in the validity of these statistical tests and the generalizability of the findings. Furthermore, the normal distribution of the respondents' interest in geotourism suggests that the gamified geospatial data in Minecraft did not significantly skew the distribution of the responses. This implies that the gamification approach used in this study successfully maintained the natural variation in respondents' interest levels and did not introduce any systematic biases.

The results of the normality test analysis for the desire survey show that the p-value obtained is 0.38827. This value indicates that there is no strong enough evidence to reject the null hypothesis which states that the observed data comes from a normal distribution. In this context, it can be concluded that data on respondents' desire to visit Indonesia after trying the gamification results tend to follow a normal distribution pattern. Furthermore, several statistical parameters were measured on the data. The mean respondents' desire to visit Indonesia is 5, indicating a high level of desire overall. The median, which is the middle value of the data, also has a value of 5, indicating the tendency of the data center toward that value. The sample standard deviation was found to be 0.26954, indicating a relatively low level of variation in the respondents' desired data. This illustrates that the majority of respondents have a level of desire that is similar or not much different from one another. In addition, measurements of skewness and kurtosis were also carried out in the data. The skewness value of -0.013027 indicates that the data tend to have nearly perfect symmetry. Further testing shows that the shape of the skewness of this data is potentially symmetrical (p-value = 0.969). Furthermore, an excess kurtosis of 0.098784 indicates that the data tends to have almost normal peaks (mesokurtic) with tails that resemble a normal distribution (p-value = 0.881). Thus, the results of the normality test which show the characteristics of the data distribution which are close to normal give confidence that the results of this study are reliable and represent the tendency of respondents from various backgrounds. This can be interpreted that the gamification of geospatial data in Minecraft has a positive influence on respondents' interest in visiting Indonesia.

FEASIBILITY ANALYSIS

The author has conducted a comprehensive feasibility analysis, employing techniques that are both relevant to the approach used and commonly applied in assessments related to geotourism and digital media creation. The findings of the analysis are outlined below:

International Journal of Geotourism Science and Development (IJGSD)
Vol.3 Issue 02, Dec 2023, pp: 51-62
ISSN: 2985-3575 (print) |ISSN: 2964-3481 (online)
DOI: https://doi.org/10.58856/ijgsd.v3i2.30

Competitive Advantage Benchmarking Analysis

Table 1. Benchmarking analysis data results that have been processed from survey data.

Benchmarking Parameter	Gamification of Geospatial Data	Geospatial Storytelling	Mobile Application	Augmented Reality App	Virtual Reality Tour	Social Media Campaign
Interactive Experience	9.18	6.92	7.74	8.9	9.03	9.42
User Engagement	9.09	7.65	7.75	8.19	6.81	9.24
Quality of Content	9.34	8.05	7.74	8.81	7.24	8.99
Accessibility	8.21	9.39	8.07	9.19	7.13	8.35
Technological Innovation	8.62	6.87	9.38	9.18	8.59	8.46
Youth Engagement	9.36	8.31	7.78	6.67	7.46	8.18
Multiplier Effect	7.89	7.43	7.48	6.32	8.98	7.34
Target User Suitability	8.75	8.86	7.91	7.56	8.73	8.05
Rank	1	6	5	3	4	2

The benchmarking analysis highlights that this gamification idea of geospatial data ranks first in terms of total score, indicating its strong performance across multiple parameters. This innovative approach to gamifying geospatial data demonstrates great potential and feasibility to be implemented as an advanced and sustainable digital geotourism media in Indonesia. The analysis reveals that this idea excels in several key areas. It receives high scores in interactive experience, user engagement, quality of content, technological innovation, Youth engagement, and target user suitability. These factors contribute to creating an engaging and immersive experience for users, ensuring their active participation and interest. By leveraging gamification techniques, this idea effectively enhances the user experience, making it more enjoyable and interactive. Moreover, this gamification concept shows strength in Accessibility, providing easy access to geospatial information and enhancing inclusivity. This aspect is crucial in catering to a wide range of users and promoting sustainable tourism practices.

The high score in Multiplier Effect highlights the potential of this idea to generate positive impacts beyond its direct users. By utilizing gamification and geospatial data, it has the capacity to attract and engage a larger audience, amplifying the benefits of digital geotourism and contributing to the growth of the tourism industry. Overall, this innovative concept of gamifying geospatial data emerges as a promising and feasible solution for advancing digital geotourism in Indonesia. Its strong performance across various parameters demonstrates its potential to offer an enhanced and sustainable geotourism experience. By effectively utilizing geospatial data and implementing gamification techniques, this idea can contribute to the promotion of Indonesia's natural and cultural heritage while providing an interactive and engaging platform for tourists and the local community.

International Journal of Geotourism Science and Development (IJGSD)
Vol.3 Issue 02, Dec 2023, pp: 51-62
ISSN: 2985-3575 (print) |ISSN: 2964-3481 (online)
DOI: https://doi.org/10.58856/ijgsd.v3i2.30

Bibliometric Novelty Analysis

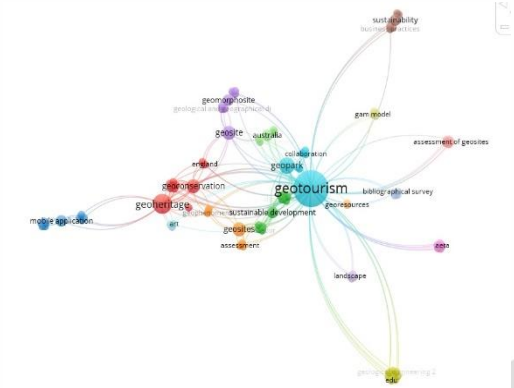


Figure 2. Bibliometric diagram created using VosViewer

In this paper the author introduces a novel approach that combines geospatial data with gamification to develop a sustainable digital geotourism platform in Indonesia. This research presents several novel contributions when compared to previous studies. Firstly, the novelty lies in the integration of geospatial data into the gamification process. The author leverages the DEM SRTM to enhance the geotourism experience by providing detailed and accurate topographical information. This incorporation of geospatial data into the gamification process adds a unique and innovative dimension to the field. Secondly, the author introduces Minecraft as a gamification medium within the geotourism context. Minecraft, a popular open-world sandbox game, offers boundless exploration opportunities and a vibrant creative community. By utilizing Minecraft as a platform for gamification, the author connects geospatial experts, creative innovators, and the younger demographic to foster the development of digital geotourism media. This innovative utilization of Minecraft in geotourism gamification has not been extensively explored in prior research. Additionally, by employing the 4D methodology within the geotourism domain, the author introduces a novel framework for effective implementation and analysis. By combining these elements—the integration of geospatial data, the incorporation of Minecraft as a gamification medium, and the application of the 4D methodology—the author provides a significant contribution to the advancement of digital geotourism in Indonesia.

PESTLE Analysis

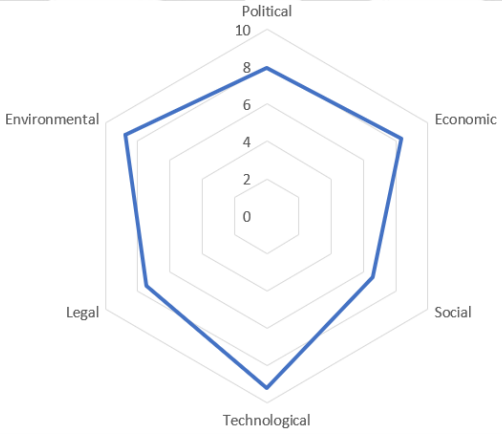


Figure 3. PESTLE analysis radar diagram processed from survey data

In terms of the political aspect, the assessment score of 7.92 indicates a relatively positive outlook. The use of gamification in digital geotourism aligns with the government's initiatives to promote tourism and sustainable development. By integrating geospatial data into a gamified platform, the paper demonstrates the potential to attract tourists and enhance the overall tourism experience in Indonesia. The government's support for technological advancements and digital initiatives further strengthens the political feasibility of implementing this digital geotourism media. Moving on to the economic aspect, the

International Journal of Geotourism Science and Development (IJGSD)
Vol.3 Issue 02, Dec 2023, pp: 51-62
ISSN: 2985-3575 (print) |ISSN: 2964-3481 (online)
DOI: https://doi.org/10.58856/ijgsd.v3i2.30

score of 8.34 highlights the strong potential for economic benefits through the gamification of geospatial data. Digital geotourism can contribute to the growth of the tourism industry, generate revenue, and create employment opportunities. By leveraging gamification techniques, the paper offers an innovative approach to attracting tourists and extending their duration of stay. This can lead to increased spending on accommodations, transportation, and local goods and services, ultimately boosting the economy.

The social aspect, with a score of 6.58, indicates moderate feasibility. Gamification has the potential to engage the younger generation and create interactive and educational experiences. By making geospatial data more accessible and enjoyable, the paper aims to bridge the gap between experts, innovators, and the youth in promoting digital tourism. However, it is crucial to address any potential challenges related to technology accessibility and ensure that the gamified platform caters to diverse user demographics, including different age groups and cultural backgrounds. Regarding the technological aspect, the score of 9.21 highlights the strong alignment between gamification and advancements in geospatial technology.

The use of Minecraft as a foundation for gamification demonstrates the integration of cutting-edge technology and creative innovation. This allows for the visualization of geospatial data in a user-friendly and immersive manner. With the availability of geospatial data and the utilization of advanced technologies, the paper showcases the feasibility of implementing this digital geotourism media.

From an environmental standpoint, the score of 8.76 indicates the potential positive impact of digital geotourism and gamification on environmental conservation efforts. By promoting virtual exploration and reducing physical travel, the paper aligns with sustainability goals and minimizes the ecological footprint associated with traditional tourism practices. It emphasizes the importance of utilizing geospatial data to create awareness and appreciation for Indonesia's natural and cultural heritage, thereby fostering environmental consciousness among tourists.

Lastly, the legal aspect, with a score of 7.45, signifies the recognition of the legal framework and regulations that support digital geotourism initiatives. It is crucial to ensure compliance with data privacy, intellectual property, and licensing requirements when gamifying geospatial data. This paper emphasizes the need for collaboration between geospatial experts, innovators, and relevant government bodies to establish guidelines and frameworks that protect the rights of data providers and users while facilitating the development of gamified digital geotourism platforms.

User Satisfaction Analysis

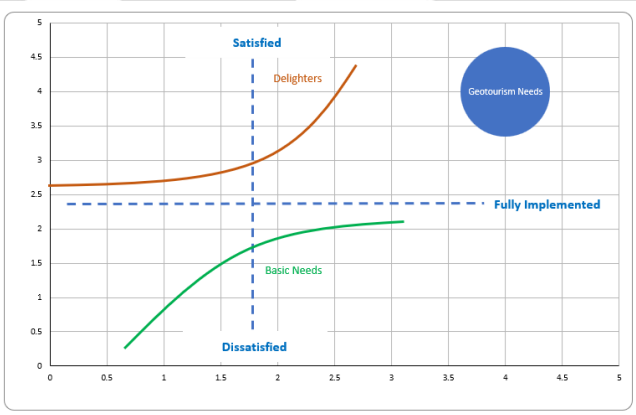


Figure 4. Kano model diagram analysis radar diagram processed from survey data.

Based on the assessment results from the Kano Model, it is evident that the utilization of gamification in geospatial data has provided a high level of user satisfaction in the context of geotourism media usage.

In terms of implementation, it is apparent that user needs related to visually appealing design, ease of use, rich multimedia content, and clear navigation guidance have been well incorporated by the provider. This indicates that users are content with the quality of gamification implementation in geospatial data. Regarding user satisfaction, needs such as accurate and up-to-date information about tourist destinations, clear navigation guidance, and personalized recommendations have resulted in a high level of satisfaction.

Users feel that geotourism media incorporating gamification in geospatial data effectively meets their needs, delivers gratifying experiences, and provides significant value in exploring tourist destinations. These findings highlight the strong relevance of employing gamification in geospatial data as an advanced and sustainable digital geotourism media to cater to user needs in the geotourism context.

FURTHER DEVELOPMENT

The author has developed a comprehensive roadmap for the gamification project, focusing on model refinement, implementation of a reward and punishment system, server integration and security, and decentralized development and community empowerment as follows:

Phase 1 - Model Refinement and Verified Validation

During the initial development stage of this gamification project, it is of utmost importance to refine the models and validate their accuracy. To achieve this, a recalibration of the data used is essential. This process involves the rasterization and normalization of DEM SRTM data, which will serve as the foundation for creating a recreated map in Minecraft. By utilizing the most updated and validated data, we aim to produce gamification results that are more representative of the real-world conditions. Furthermore, the dissemination of geospatial data gamification presents an exciting opportunity for collaboration between geospatial information agencies, the government, and local tourism managers. This collaboration will ensure that the gamification project aligns with the objectives and priorities of the tourism industry. By working together, we can enhance the quality and accuracy of the gamification models, thereby providing a more immersive and realistic experience for users.

To ensure the integrity of the recreated map, it is crucial to pay attention to detail. The map models need to be meticulously crafted to accurately depict the natural features and landmarks of the respective areas. This attention to detail will enhance the users' experience and allow them to explore the gamified environment with a greater sense of authenticity. During the playtesting phase, it is essential to involve a diverse range of participants who can provide valuable feedback. By defining clear parameters and criteria at the outset, we can gather relevant data and insights to validate the effectiveness of the gamification models. This dissemination process serves a dual purpose: not only does it refine the gamification project, but it also allows us to collect raw data that can be used to validate and improve other geotourism media. This validation process should involve experts and competent reviewers who can assess the models, algorithms, and data used. By subjecting the gamification project to rigorous validation, we can ensure that the results are valid, accurate, and reliable. The data and processing results obtained from the validation process will serve as a foundation for further improvement and development in subsequent stages. They will provide valuable insights into areas that require adjustment and refinement. By incorporating these insights, we can enhance the gamification project and ensure its continuous advancement.

Phase 2 - Development and Implementation of Reward and Punishment System

The next phase of the gamification could focuses on the development and implementation of a reward and punishment system within the gamification framework. The inclusion of such a system will foster greater engagement among participants, transforming them into active contributors to the digital tourism media.

Participants exploring the gamified Indonesian maps, particularly those highlighting special tourist destinations, will not only have the opportunity to navigate and explore the virtual landscapes but will also be rewarded for their achievements. This approach aims to increase interest and sustained usage of the digital tourism media by offering compelling incentives and unique experiences to tourists. To create an

immersive and captivating experience, the integration of relevant regional stories and local wisdom becomes paramount. By incorporating these elements into the reward and punishment system, we can provide participants with a deeper connection to the cultural and natural heritage of the respective areas.

Additionally, the inclusion of "easter eggs" that can be exchanged for special prizes or physical travel vouchers adds an extra layer of excitement and appeal, effectively promoting various tourist destinations across Indonesia. In addition to rewards, it is equally important to incorporate punishments within the gamification system. These punishments should be linked to local and national rules and policies, ensuring that participants adhere to the prescribed regulations. By enforcing rules that promote respect for local customs and regulations, we can highlight the principle of unity in diversity that Indonesia embodies. The development and evaluation of the reward and punishment system will require collaboration with multiple stakeholders, including government agencies, companies, and NGOs. This collaborative effort aims to accelerate the growth of geotourism in Indonesia by aligning the gamification project with the goals and initiatives of various organizations. By joining forces, we can create a dynamic and impactful gamification system that benefits both tourists and local communities.

Phase 3 - Server Integration and Security in Wider-Scale Dissemination

Once the gamification system has undergone evaluation and improvement, the next step is to integrate it with servers managed by relevant agencies, such as the geospatial information agency and the Indonesian Ministry of Tourism and Creative Economy. This integration is crucial for efficient management, supervision, and security, ensuring the long-term sustainability of the gamification project. With an integrated server infrastructure in place, the gamification project can be disseminated on a larger scale, reaching a wider audience. Furthermore, it provides an opportunity to showcase the project in international forums, attracting potential investors and tourists to Indonesia. The wider-scale dissemination of this gamification not only positions it as an advanced geotourism medium but also as a platform for introducing and preserving culture, providing inclusive education, and promoting digital creative economy products.

To ensure the security and integrity of the server integration, robust measures need to be implemented. This includes data protection, user authentication, and monitoring systems to safeguard the gamification project from unauthorized access or malicious activities. By prioritizing security in the server integration process, we can instill confidence in users and stakeholders, fostering a sustainable and trusted digital tourism environment.

Phase 4 - Decentralized Development and Community Empowerment

In order to ensure that the benefits resulting from the wider-scale dissemination of this gamification project are felt by various stakeholders, decentralization of the development process and community empowerment are vital. Decentralization, in this context, refers to the need to educate the public in various tourist areas, particularly those engaged in futurism, to independently manage their regional gamification maps while maintaining regular coordination and reporting to the central management. Empowering local communities is crucial for the success and sustainability of the gamification project. By strengthening local tourism awareness groups and engaging them in the development and utilization of Indonesia's digital geotourism potential, we can ensure that the project's benefits reach the grassroots level. This approach encourages active participation and ownership among local communities, fostering a sense of pride and responsibility in managing their regional gamification maps. By implementing a decentralized development model and empowering local communities, we create an environment that enables continuous improvement and innovation. Local communities can contribute their unique knowledge and insights, ensuring that the gamification project remains relevant and responsive to the needs of each specific region.

4. CONCLUSION

The gamification project outlined in the paper focuses on refining geospatial data models and creating an immersive digital tourism experience in Indonesia. The roadmap encompasses various phases, including

model refinement, implementation of a reward and punishment system, server integration and security, and decentralized development and community empowerment. By following this roadmap, the project aims to enhance the accuracy and realism of the gamification models, increase user engagement, promote local cultural and natural heritage, and contribute to the growth of geotourism in Indonesia.

The author is fully aware that this paper is far from perfection and has several shortcomings. However, despite the shortcomings and limitations of this paper, the author believes that there is potential for further development and use of this paper. Therefore, the author provides some suggestions to several parties as follows:

1. **For Other Researchers:**
   a. Collaborate with geospatial information agencies, government entities, and local tourism managers to ensure the accuracy and validity of the gamification models.
   b. Conduct thorough playtesting and involve diverse participants to gather feedback and validate the effectiveness of the gamification project.
   c. Involve experts and competent reviewers in the validation process to ensure the reliability and quality of the data and algorithms used.

2. **For Government Authorities:**
   a. Support the gamification project by providing resources, infrastructure, and policy frameworks that align with the goals of geotourism development.
   b. Collaborate with stakeholders to develop and implement a reward and punishment system that promotes adherence to local regulations and customs.
   c. Facilitate the integration of the gamification project with server infrastructure managed by relevant agencies to ensure efficient management, supervision, and security.

3. **For Tourism Stakeholders:**
   a. Engage in collaborative efforts with government agencies, companies, and NGOs to contribute to the development and evaluation of the reward and punishment system.
   b. Incorporate relevant regional stories, local wisdom, and "easter eggs" into the gamification framework to provide a deeper connection to cultural and natural heritage.
   c. Promote the gamification project as a means to attract tourists, showcase various destinations, and foster the growth of geotourism in Indonesia.

4. **For the General Public:**
   a. Participate in the gamification project and provide feedback to contribute to its refinement and improvement.
   b. Embrace the concept of unity in diversity by respecting local customs, regulations, and rules embedded within the gamification system.
   c. Support community empowerment initiatives and decentralized development to ensure the sustainability and local ownership of regional gamification maps.

REFERENCES

[1] Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Education and information technologies, 25(6), 5261-5280.
[2] Alwi, S. (2013). ITQAN: Jurnal Ilmu-Ilmu Kependidikan, 8(2), 145-167.
[3] Ayu, M. (2020). The Journal of English Literacy Education: The Teaching and Learning of English as a Foreign Language, 7(1), 47-54.
[4] Boulianne, S., & Theocharis, Y. (2020). Social Science Computer Review, 38(2), 111-127.
[5] Calabrese, A., Costa, R., Ghiron, N. L., Tiburzi, L., & Pedersen, E. R. G. (2021). Technological Forecasting and Social Change, 169, 120816.
[6] Dreimane, S. (2019). Didactics of smart pedagogy, 453-464.
[7] Ekaputra, G., Lim, C., & Eng, K. I. (2013). ISICO 2013, 2013.

[8] Hamari, J. (2019). In The Blackwell Encyclopedia of Sociology (pp. 1–3). John Wiley & Sons, Ltd. doi:10.1002/9781405165518.wbeos1321
[9] Iqbal, M., Nadia, H., & Saiddinullah, A. (2020). Jurnal Geosains Terapan, 3(1), 82-82.
[10] Jaafar, M. (2012). Geografia Online Malaysia Journal of Society and Space, 8(3), 82-92.
[11] Jebur, A. K. (2021). Saudi Journal of Civil Engineering, 5(2), 18–25. doi:10.36348/sjce.2021.v05i02.001
[12] Knezovic, Andrea. (2022). Udonis Mobile Marketing Agency.
[13] Lane, H. C., & Yi, S. (2017). In Cognitive development in digital contexts (pp. 145-166). Academic Press.
[14] Luo, Z. (2022). Education and Information Technologies, 27(1), 891-915.
[15] Mangaroska, K., & Giannakos, M. (2018). IEEE Transactions on Learning Technologies, 12(4), 516-534.
[16] Nee, A. Y. H. (2023). Digital Transformation in Aviation, Tourism and Hospitality in Southeast Asia, 24-42.
[17] Oktavianto, D. A. (2018). Jurnal Teknodik, 73-73.
[18] Panis, I., Setyosari, P., Kuswandi, D., & Yuliati, L. (2020). International Journal of Emerging Technologies in Learning (iJET), 15(12), 244-255.
[19] Poondej, C., & Lerdpornkulrat, T. (2019). Interactive Technology and Smart Education, 17(1), 56–66.
[20] Purwanto, E., & Harani, A. R. (2020). In IOP Conference Series: Earth and Environmental Science (Vol. 402, No. 1, p. 012024). IOP Publishing.
[21] Sopaheluwakan, J. (2007). Publikasi Khusus Geologi Indonesia: Dinamika dan Produknya, 1(33), 1–27.
[22] Suwito, S., Sari, Y. I., Wahyudianto, T., & Wardani, N. R. (2016, August). In Prosiding Seminar Nasional Pendidikan Geografi FKIP UMP 2016.
[23] Tejomurti, K., & Hermawan, S. (2022). Acta Law Journal, 1(1), 16–25.
[24] Vitoria, L., Mislinawati, M., & Nurmasyitah, N. (2018, September). In Journal of Physics: Conference Series (Vol. 1088, No. 1, p. 012058). IOP Publishing.
[25] Wheeler, J., & Cheadle, M. (2014). In Reference Module in Earth Systems and Environmental Sciences.