Integrated big data innovation in tourism management through the Pesona Karanganyar platform, Central Java

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ABSTRACT

The article examines the potential of big data application on the Pesona Karanganyar website to improve tourism management and boost tourism in Karanganyar Regency. The research uses Rogers' innovation attributes theory to address challenges faced by government managers and users in accessing information. The qualitative method includes website analysis, literature review, interviews, and data analysis using the interactive model. The results show that the website has a large, complex, and diverse data set that can meet information needs comprehensively. The website's innovations retain similarities without eliminating distinctive features. It adheres to simplicity, providing ease for users. The website's simple features make it easy for users to try out new features. Despite the extensive information, the website's ease of observation makes it easy for users to read and understand. However, challenges faced by the Karanganyar Regency Government in managing this website include technical errors such as signal disruptions and unexpected maintenance, which hinder users from accessing information and features on the website. To address this, continuous monitoring and evaluation of the Pesona Karanganyar platform are necessary to ensure technical reliability and service sustainability. This strategic step will not only optimize the user experience and enhance Karanganyar's tourism competitiveness but also provide a foundation for the development of a more robust and adaptive digital tourism management system in the future.

1. INTRODUCTION

Tourism in Karanganyar Regency has experienced rapid growth in the past five years. This has made it one of the premier destinations in Central Java, with natural and artificial attractions spread across various locations. The Department of Tourism, Youth, and Sports (Disparpora) of Karanganyar Regency reported that a total of 2,434,443 tourists visited 56 tourist destinations in the region throughout 2024. This figure comprises 8,322 foreign tourists and 2,503,928 domestic tourists. However, this growth brings challenges in tourism management, especially in the current digital era (Wardani, 2023; Huda, 2020).

Tourism has become one of the sectors most affected by digitalization, with the need for the integration of tourism potential through good governance (Adsqoo, 2023). Integrated and big data-based tourism data management is essential to facilitate information access for tourists (Firman, 2025; Ranganai et al., 2023). To address this issue, the Karanganyar Regency Government has made innovations to improve tourism governance in the digital era, namely by establishing the Pesona Karanganyar website. This is in line with the policy direction in the Regional Medium-Term Development Plan (RPJMD) of Karanganyar Regency for the years 2018-2023 regarding the development of a smart and interconnected multisectoral tourism network (Huda et al., 2023).

The Pesona Karanganyar website provides comprehensive information about tourist destinations and local potential in Karanganyar. This innovation is one of the efforts to integrate big data by the Karanganyar Regency Government. This is in line with Sustainable Development Goals (SDGs) number 9 regarding infrastructure development, industrialization, and innovation. The formation of innovations integrated with the utilization of big data is crucial for the development of ecology and entrepreneurship (Zhou & Yang, 2023; Kasinathan et al., 2022; Castro & Lopes, 2022).

According to Kusumah et al. (2024), the use of big data helps strengthens the decision-making process by providing accurate analysis of market patterns and consumer preferences. This is important for creating sustainable innovation and competitive advantage. Organizations that leverage big data analytics can optimize strategies and respond to market changes quickly, thereby maintaining their competitiveness (Putra et al., 2023; Putriani et al., 2023; Zhang et al., 2022).

Nevertheless, the use of big data faces its own challenges, such as organizational capacity limitations that can hinder the ability to analyze and utilize big data effectively (Liu et al., 2023; Klievink et al., 2017). In addition, there are also challenges related to compliance, communication, security, privacy, and trust in the management of big data in the tourism sector (Nugroho et al., 2019). Therefore, it is important to conduct an in-depth study regarding the innovation of Pesona Karanganyar that integrates big data in tourism management. This aims to optimize the utilization of big data to enhance the effectiveness of tourism management, thereby addressing the challenges and opportunities in the digital era.

Thus, the problem formulation in this research is 1) How can the application of big data improve tourism management in Karanganyar Regency? 2) What is the impact of big data application on the development of promotional strategies and the increase in tourist visits in Karanganyar? 3) What are the challenges faced in integrating big data into the tourism management system of Karanganyar? 4) To what extent can big data innovation support the sustainability and competitiveness of Karanganyar tourism?

A bibliometric analysis using VOSviewer was performed to identify gaps in the examined research connected to prior studies (Oktavio et al., 2024). The data utilized is derived from academic articles in the Scopus database, comprising 439 documents from 2017 to 2024, featuring the keywords big data and tourism. The findings indicate that research on big data and tourism is often associated with tourism development, tourism management, sustainable development, artificial intelligence, and big data analysis. Currently, research on big data and its application in tourism innovation for management remains limited. The graphic below illustrates this more explicitly.
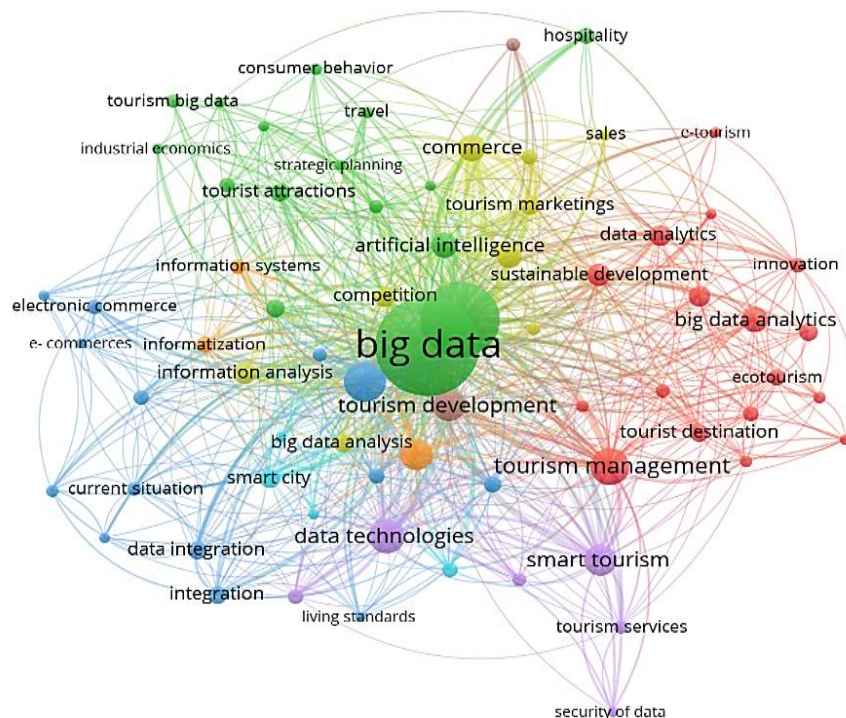

Figure 1. VOSviewer Analysis
Source: Bibliometrics VOSviewer (2024)

This can be seen in the research by Fan et al. (2024) which examines how big data innovation can enhance integrated development in public cultural and tourism services by predicting trends, meeting tourist needs, and providing improvement recommendations. On the other hand, research by Xiao (2024) explained that the integration of big data in tourism is used to predict and analyze consumer behavior, as well as to enhance the development of the tourism industry through innovative models. Meanwhile, the research by Rehman et al. (2024) explores how big data analysis, economic factors, and policy frameworks influence sustainable tourism development and highlights the integrated role of these three in shaping attitudes and behaviors in the tourism sector.

Based on this, previous research has focused on the application of big data in tourism development and the prediction and analysis of consumer behavior. The novelty of this research lies in examining big data innovation in tourism management in Karanganyar Regency, which is one of the leading destinations in Central Java, with an approach that emphasizes in-depth exploration of how the integration of big data in the Pesona Karanganyar innovation can strengthen tourism management.

The theoretical basis used in this research is the innovation attribute theory by Rogers (2003) in Aprilia Hapsari et al., (2021), which consists of 5 indicators, namely: 1) Relative Advantage (relative advantage) is the relative advantage used as a reference in assessing whether the innovation process will be better than the existing innovations; 2) Compatibility is the innovation process that is consistent with previously established values. Based on past experiences, as well as the needs of potential adopters, 3) Complexity refers to the level of difficulty in using the innovation. 4) Trialability, which refers to the process of innovation that emphasizes field testing or product trials; 5) Observability (ease of observation), as a reference in assessing its usefulness in the service delivery process.

Although some literature has extensively reviewed the role of big data in tourism marketing, there remains a significant gap in studies that specifically examine its role in regional tourism management systems in Karanganyar. This research aims to bridge this gap by deeply exploring the integrated big data innovation on the Pesona Karanganyar platform. The expected benefits of this study are not only to provide a theoretical contribution through the application of Rogers' Innovation Attributes Theory but also to offer clear practical implications. For policymakers, these findings can serve as a basis for formulating more effective and sustainable digital tourism governance strategies. Meanwhile, for tourism stakeholders, this research provides insights into how to optimize the use of a digital platform to enhance competitiveness. Lastly, for the local community, this study is expected to highlight the platform's potential in increasing participation and economic benefits from the tourism sector.

2. METHODOLOGY

This study employs a qualitative method to provide a systematic, factual, and accurate description. This approach emphasizes understanding phenomena through descriptive and contextual analysis (Abu Bakar et al., 2022; Creswell, 2018; Creswell, 2014). Data collection was carried out using methodological triangulation, which includes secondary data analysis (literature review and website analysis) and primary data (interviews with stakeholders). The website analysis was performed on the Pesona Karanganyar platform, while interviews were conducted in a semi-structured manner with a number of informants selected based on specific

criteria. To maintain transparency in research ethics, informed consent was obtained from the informants.

The employed data analysis technique is the interactive model, which enables researchers to examine and evaluate data systematically and comprehensively (Moleong, 2012; Bazeley & Jackson, 2013). The stages in the interactive model commence with data collection from diverse sources, followed by the reduction or filtration of pertinent data for enhanced efficiency, the presentation of data in a structured yet comprehensible format, and culminate in the derivation of conclusions where the analytical results address the research questions.

3. RESULTS AND DISCUSSION

The Pesona Karanganyar website is an official website directly managed by the Karanganyar Regency Youth and Sports Tourism Office to enhance information services for the general public regarding the tourism potential and beauty in Karanganyar. The implementation of this innovation is a smart step by the government in utilizing digital technology for tourism management by collecting data in the form of tourism potential or objects into big data that is integrated through the website. Thus, the presented big data is capable of providing comprehensive tourism information that can be accessed by the general public (Huda et al., 2025).

To determine how effective and beneficial the website is, it is necessary to examine and analyze it in terms of the quality of information provided by the government and user satisfaction when accessing the services available on the website. According to research conducted by Mulia et al., (2023) based on the Webqual 4.0 method, the application of big data in terms of usability, information quality, and interaction quality on the Pesona Karanganyar website is considered to be of high quality. Although the information presented is of high quality, other aspects may not necessarily be of high quality.

Therefore, in order to understand the effectiveness of big data implementation on improving tourism management and increasing tourist visits, the researcher will analyze the Pesona Karanganyar website using Rogers' Innovation Attributes theory (2003) as cited in Aprilia Hapsari et al., (2021), which consists of 5 indicators: relative advantage, compatibility, complexity, trialability, and observability. Here is the analysis discussion.

Relative Advantage

The first indicator focuses on how an implemented innovation can provide greater benefits and value compared to previous innovations. An innovation is considered to have a relatively high advantage if users perceive it as something that can meet their needs or expectations (Swim, 2017). If viewed from the innovation of Pesona Karanganyar, the initial

appearance presented to users is able to meet the initial purpose of why they want to visit the website.
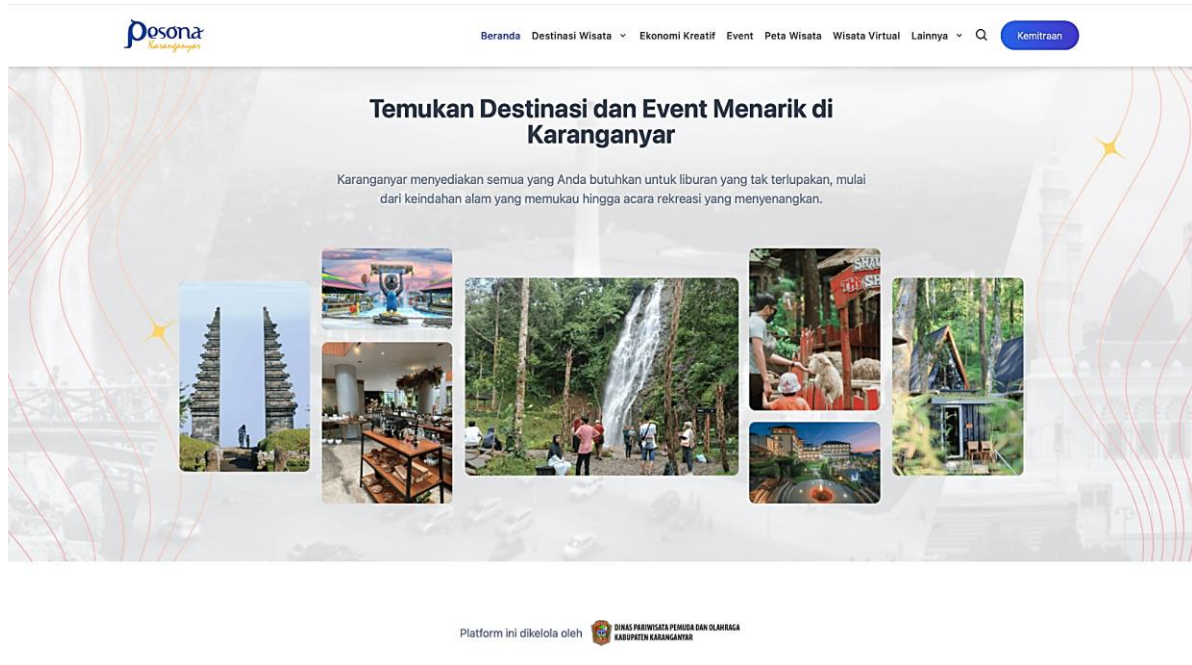

Figure 2. Initial View of the Pesona Karanganyar Platform
Source: Pesona Karanganyar Platform (2025)

The Pesona Karanganyar website has various relative advantages that can be felt by the wider community, especially for those who want to explore further the enchanting things that Karanganyar Regency has to offer. If viewed from the aspect of public service, the main advantage presented on this website is that it has big data, or a very large, complex, and diverse collection of data, capable of providing comprehensive information. There are six main pieces of information that can be accessed, namely:

a. Tourist Destination

Karanganyar Regency is an area with diverse tourism potential, ranging from cultural, religious, to artificial nature tourism (Wibowo et al., 2021). Through this website, big data/information regarding tourist destinations has been well integrated and structured. Starting from tourist attractions, there are accommodations, tourist villages, eateries & restaurants, souvenir centers, types & routes of transportation, public entertainment, to spas & beauty services, users can access the available information according to their needs.

Figure 3. Information Features Regarding Tourist Destinations
Source: Pesona Karanganyar Platform (2025)

b. Creative Economy

In addition to the tourism sector, Karanganyar is also one of the regencies in Central Java Province that has great potential in the creative economy sector, especially in the fields of arts and crafts (Estiyantara, 2021). This is evidenced by the abundance of information about local products/crafts presented on the Pesona Karanganyar website. Starting from game development products, architecture, interior design, music, fine arts, product design, fashion, culinary, film, animation, video, photography, visual communication design, television and products, crafts, advertising, performing arts, publishing, and applications.
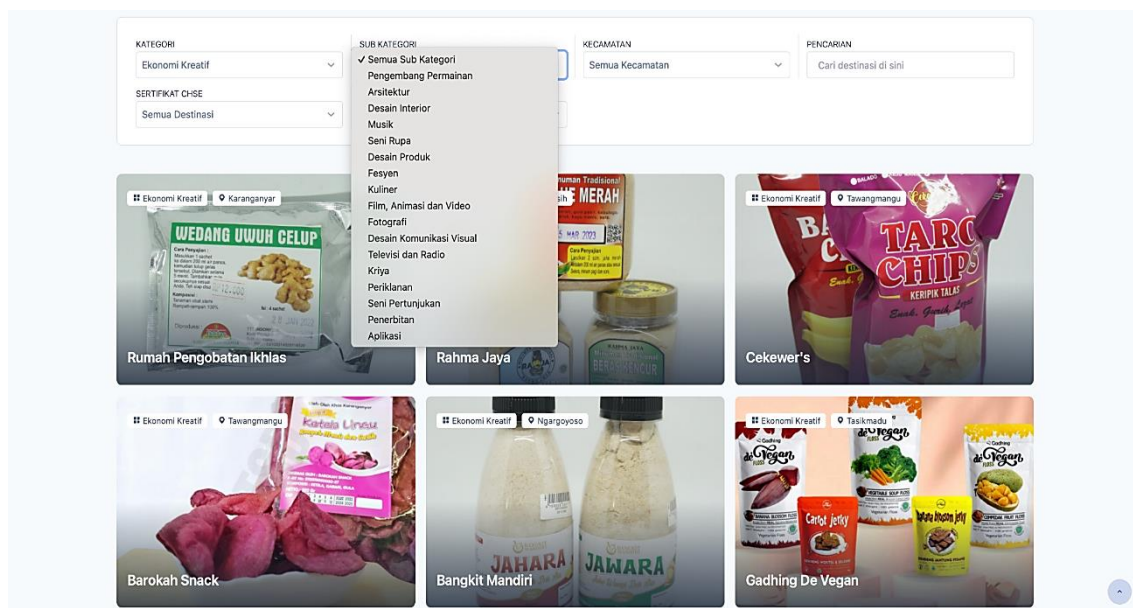

Figure 4. Information Features Regarding the Creative Economy
Source: Pesona Karanganyar Platform (2025)

c. Events

In order to promote and preserve local culture, the Karanganyar Regency Government regularly holds various interesting events such as music festivals, culinary bazaars, art performances, and traditional ceremonies. In addition to serving as entertainment for the local community, these events can also attract tourists/visitors. All information regarding upcoming or ongoing events, including the event name, date, time, and location, is already listed on the Pesona Karanganyar website. Thus, this provides an advantage for users who want to attend interesting events in Karanganyar.
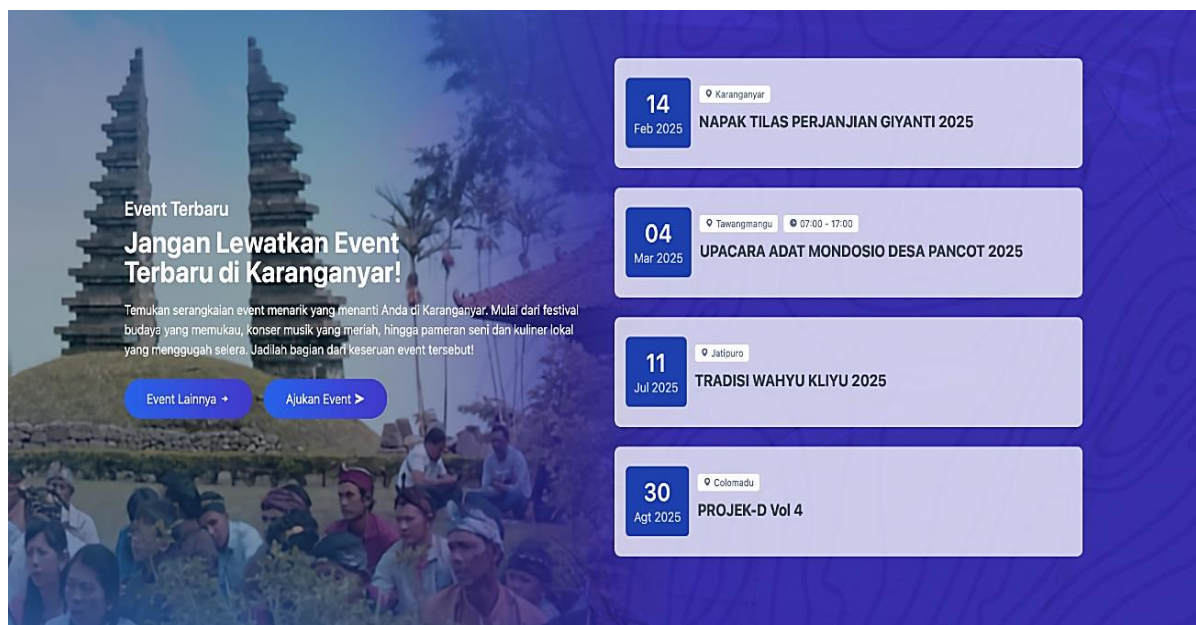

Figure 5. Event Information Features
Source: Pesona Karanganyar Platform (2025)

d. Tourist Map

With an area of approximately 77,378.64 hectares, the presence of the Karanganyar Tourism Destination Map feature will certainly make it very easy for users to know the location or existence of the places they will visit (Haksoro et al., 2024).
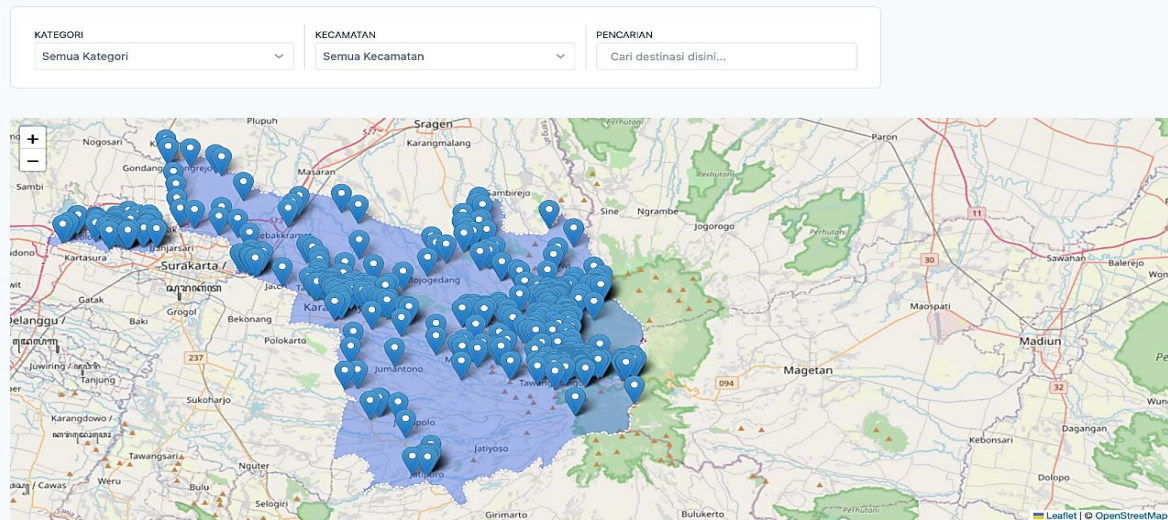
Figure 6. Tourist Map Information Features
Source: Pesona Karanganyar Platform (2025)

e. Virtual Tourism

Virtual tourism is a tourism promotion concept that utilizes digital-based technology, allowing users to explore a tourist destination using only a smartphone and an internet connection from home (Cardona et al., 2023). Although this concept was very popular during the Covid-19 pandemic, its existence is still implemented by many parties because it is effective for promoting tourism, one of which is the Karanganyar Regency Government through the Pesona Karanganyar Website. The virtual tourism used takes the form of videos and can be watched on the YouTube platform.
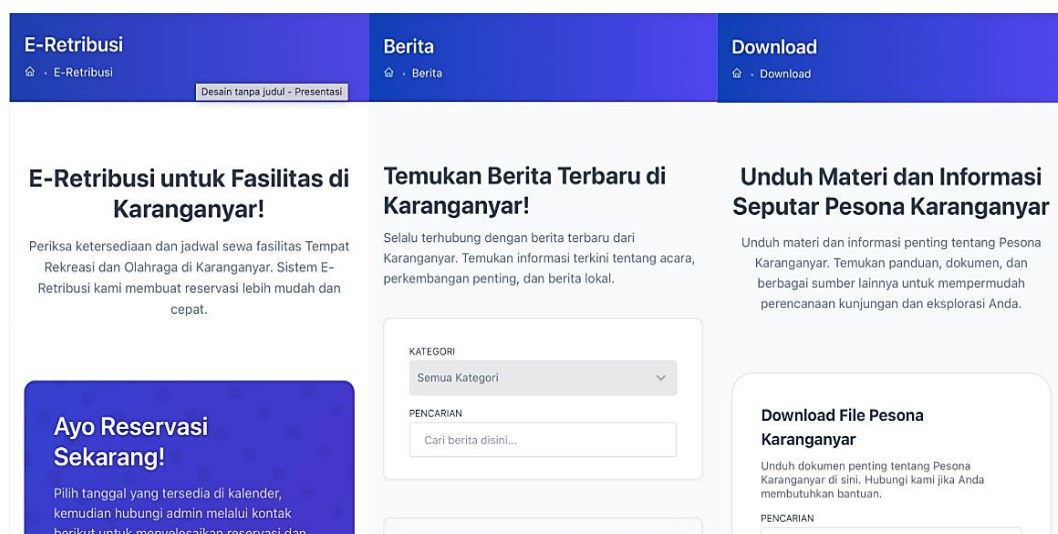

Figure 7. Virtual Tour Information Features
Source: Pesona Karanganyar Platform (2025)

f. Others

In other features, the Pesona Karanganyar website presents various information or supporting features related to tourism in Karanganyar. Starting with the E-Retribusi feature, which aims to assist users in making reservations for the rental of recreational and sports facilities in Karanganyar. Then there is the News or Blog feature, aimed at providing the latest information about events, important developments, and local news. Next, there is a Download feature, which contains materials and information about the Pesona Karanganyar platform that users can download. For example, the Tourism Catalog, Nature Tourism Brochure, Cultural Tourism Brochure, and Soloraya Tour Packages.

Figure 8. E-Retribution Information, News, and Download Features
Source: Pesona Karanganyar Platform (2025)

Based on the main information presented above, it can be concluded that the innovation on the Pesona Karanganyar Website has advantages that are relatively capable of providing various benefits to users or the general public, especially tourists. Users can obtain various comprehensive information about tourist attractions, events, and interesting facilities/places in Karanganyar Regency. In addition, this website also provides information about the arts and culture preserved by the local community.

Meanwhile, for the government, the benefit obtained is the ability to increase the number of tourists or visitors to existing destinations or organized events. The increase in these numbers indirectly has the potential to boost the local economy as destination managers, event organizers, or local MSME owners. Thus, the tourism management carried out by the

Government through the Pesona Karanganyar Website is considered to have a relative advantage in increasing the overall regional income.

Suitability

The second indicator focuses on the aspect of compatibility between the introduced innovation and the innovations or activities that have previously existed. This indicator is a proactive step to ensure that the innovation implemented does not erase the values, essence, and characteristics that have already been embedded in previous innovations or activities (Safira et al., 2023). In the context of innovation brought by the government, the Pesona Karanganyar website has been launched since 2020, specifically on September 30. Before the existence of that website, the management of tourism information was still integrated with the official website of the Karanganyar Government. Although there have been changes, the innovations implemented through the website still retain similarities/compatibilities that do not eliminate the characteristics/substance of the previous innovations.

Complexity

The third indicator focuses on the level of difficulty in understanding and using an innovation. Because it is new, an innovation may have a higher level of complexity compared to previous innovations, or vice versa. This indicator aims to analyze how easily the implementation of big data through a website can be applied and maintained by the government and how easily the website can be used and enjoyed by the general public, in this case, the users (Sukatno, 2020). The implementation of big data through platforms or websites is a good step for the Karanganyar in keeping up with current digital developments.

There are five benefits that the Karanganyar Regency Government can experience as the developer of innovation on the Pesona Karanganyar website. First, by providing comprehensive information about Karanganyar tourism, it allows the government to deepen their understanding as a form of accountability for the presented data. Second, enhancing experience and skills in managing website-based big data, including the ability to present content/features relevant to user needs. Third, anticipating the lag in demand and technology trends. With the integration of big data through the website, the government will easily develop the website proactively and responsively to the dynamic needs of users. Fourth, improving public services that are cost-effective and time-efficient. This is certainly not only felt by the government but also by the users.

Lastly, driving competitive and sustainable excellence. By leveraging the insights they possess as well as user assessments or evaluations, the government can continuously improve their applications, add innovative features, and adapt to customer needs. This ultimately provides a competitive advantage and strengthens the market position. Based on

the above benefit analysis results, it can be concluded that the level of complexity of the innovation carried out by the Karanganyar Regency Government is low. This is also evidenced by the presentation of neat and high-quality features and content on the website's display.

Possibility of Being Tried

The fourth indicator focuses on the testing or trial phase to prove that the implemented innovation provides advantages or added value compared to previous innovations (Sukadari, 2020). If we examine the analysis of the discussion on relative advantage above, in terms of initial appearance, which only presents information, the Pesona Karanganyar website has proven to have quality information that can meet the needs of users. But what if we consider the indicator of try-ability? What features can users easily try out directly? Here are the findings from the Pesona Karanganyar website observation.

a. "Explore the Charm of Destinations in Karanganyar" Feature

This function is the main feature of the Pesona Karanganyar website, this tool enables users to investigate diverse places and facilities in Karanganyar based on their requirements. According to the illustration, visitors must complete three search fields to utilize this feature: 1) Category, encompassing options for categories pertaining to destinations, tourist attractions, or facilities for your search; 2) District, comprising options for districts/areas within Karanganyar; 3) Search, which can be directly populated with the name of the destination, tourist attraction, or facility you wish to visit. The remaining two components, specifically the Cleanliness, Health, Safety, and Environmental Sustainability (CHSE) Certificate and the e-Catalogue, may be completed optionally or modified based on the chosen destination or facility above.
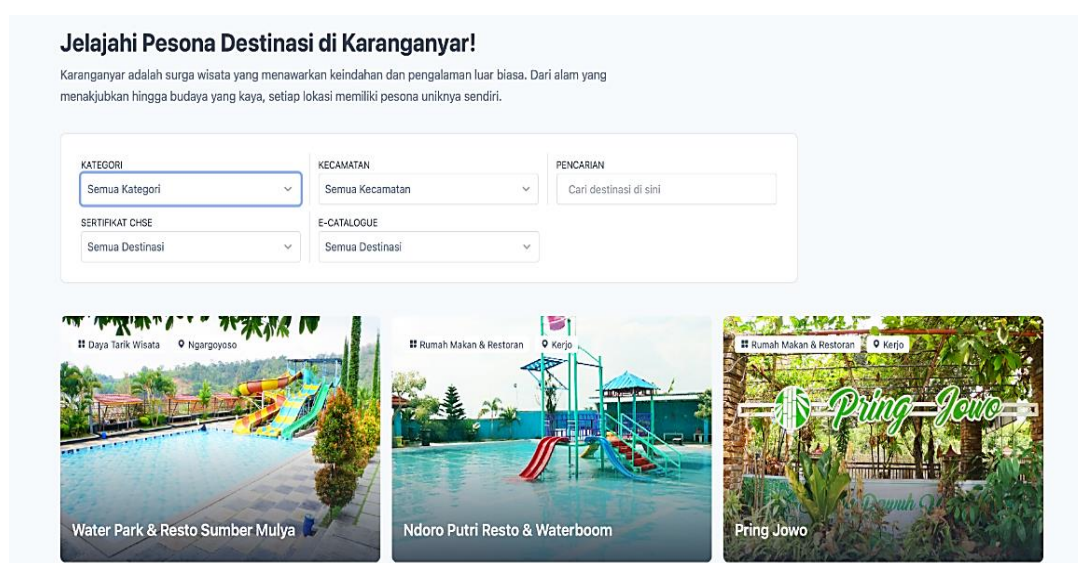

Figure 9. "Explore the Charm of Destinations in Karanganyar" Feature
Source: Pesona Karanganyar Platform (2025)

b. Functionality for "Event Search and Event Submission"

The Pesona Karanganyar website gives information about tourist locations as well as details about local events available for participation. The Karanganyar Government offers numerous chances for anyone seeking to propose event implementations. As either a provider of event concepts or as a collaborator in event planning. This reflects the government's commitment to addressing the community's expectations and recommendations for event implementation in Karanganyar Regency.
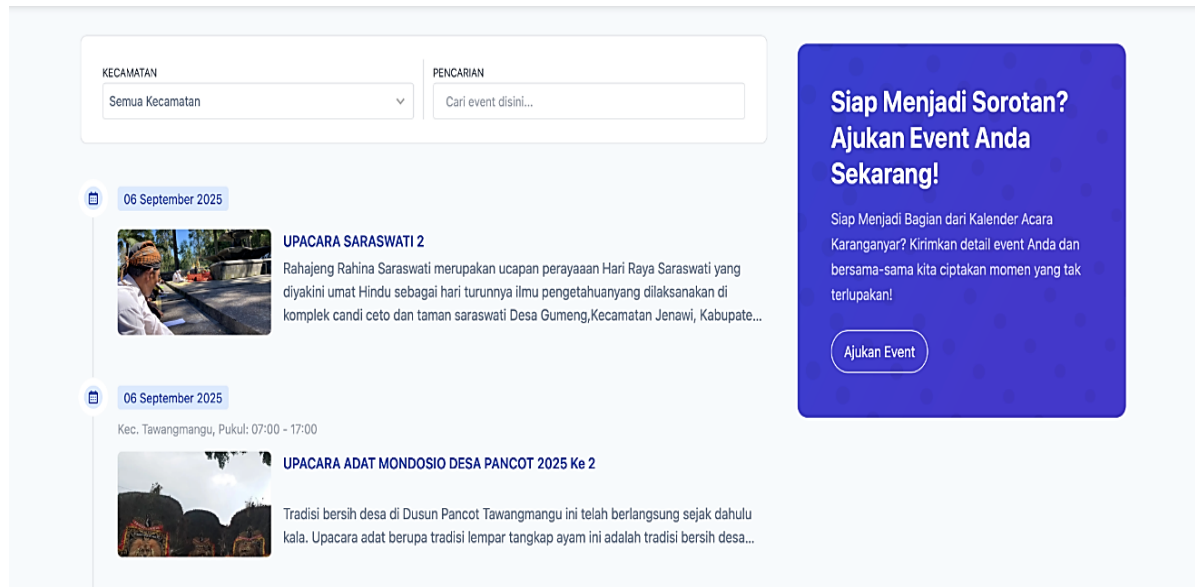

Figure 10. "Event Search and Event Submission" Features
Source: Pesona Karanganyar Platform (2025)

c. "Partner Registration" Feature

This website provides access to information regarding the allure and tourism of Karanganyar while also facilitating opportunities for collaboration and partnership establishment. This enables people to participate in the collaboration to enhance the allure of Karanganyar. Based on the platform Pesona Karanganyar, there are three characteristics that consumers may be able to explore, specifically: The registration functionality as a new partner, users will initially be instructed to establish a website account. Subsequently, customers may select the type of partnership they wish to form. For instance, local MSME collaborators, event partners, or tourism investors; 2) a partner panel or community feature exclusively for users who have previously registered as partners; and 3) a destination claim feature that enables users to assert ownership of destinations/tourist attractions not yet documented by the Karanganyar Government. These users typically originate from tourist managers or residents of villages with considerable tourism potential.
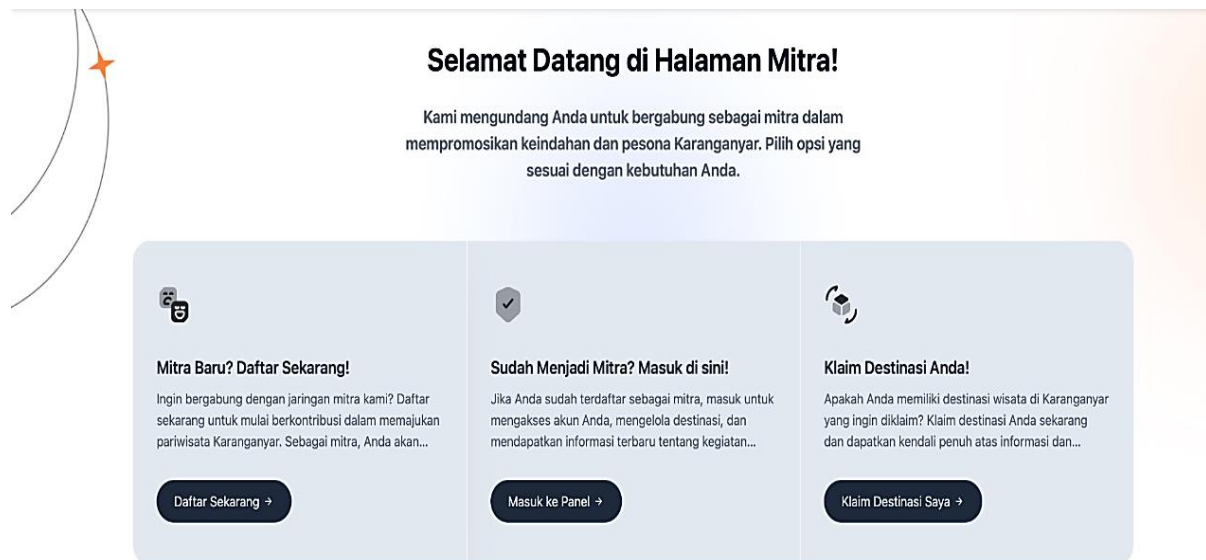
Figure 11. "Partner Registration" Feature
Source: Pesona Karanganyar Platform (2025)

d. Others

Alongside the three primary functions mentioned, there are other additional features that consumers may explore. The "Tourist Map" feature enables users to locate destinations and facilities in Karanganyar via map representation. The "Virtual Tour" feature enables viewers to view the virtual tour of Karanganyar. The e-Retribusi tool enables users to reserve specific destinations or facility rentals. The News Feature enables viewers to access the most recent updates regarding the allure of Karanganyar. The download feature enables users to obtain documents and information regarding the attractions of Karanganyar. Finally, the contact feature enables people to reach out to the official Karanganyar government for any inquiries or conversations required.

Facilities Observed

The fifth indicator focuses on how an innovation can be observed in terms of its functionality and the benefits it produces. Generally, electronic-based service innovations such as those implemented on the Pesona Karanganyar website are quite easy to understand and accept by the community (Handratna et al., 2022). This is because the concept of technology and digitalization operates on the principle of simplicity. This means that the public will easily observe and understand the information presented virtually, namely through websites, making it easy to use and its benefits immediately felt.

Based on interviews with 20 sources who have used or visited the Pesona Karanganyar website, 95% expressed satisfaction with the website compared to before. The majority of respondents expressed that the Pesona Karanganyar website is easy to access, both through computers and mobile phones. In addition, there are various comprehensive features that

make it easier for users, especially for tourists who are visiting the Karanganyar area for the first time. One of the main reasons for their satisfaction is the ease of finding important information, such as lists of tourist attractions, culinary spots, event information, tourist maps, and clear and detailed virtual tours.

> *"I am very satisfied with the Pesona Karanganyar website because its features are very complete and easy to understand, making it pleasant to use. No hassle at all for us as visitors, we can get clear information and a good picture of the tourist attractions we will visit."* said Tiwi (platform user).

Many visitors also appreciate the website's user-friendly appearance with an attractive design and intuitive navigation, allowing them to easily explore various content without feeling confused. In addition, the information presented is always complete, providing more comfort for tourists who want to plan their trips better. The sources also believe that this website makes a significant contribution in promoting the tourism potential of the Karanganyar region to a wide audience, making prospective visitors more interested in visiting and exploring the interesting places in the area. Not only that, several interactive features, such as location maps and user reviews, also add value for visitors looking for references before making a decision to visit. Overall, the Pesona Karanganyar website is considered very effective in enhancing the tourist experience and providing useful information for planning visits more smoothly and enjoyably.

As for the 5% of respondents who were less satisfied with the website, they expressed that the main issue they faced was frequent access disruptions or unexpected maintenance. This makes it difficult for users to access information or services smoothly, especially when urgently needed. These technical disruptions can reduce user comfort and trust in the site. Therefore, it is important for website administrators to ensure more stable service availability and to inform users of maintenance schedules more transparently so that the user experience remains optimal.

4. CONCLUSION

Based on the results and discussion above, it can be concluded that the innovation implemented by the Karanganyar Regency Government through the Pesona Karanganyar website has integrated big data well. Referring to the innovation theory proposed by Rogers, the analysis of these five attributes shows good results. Starting with the first, there is Relative Advantage. This website has big data, or a very large, complex, and diverse collection of data that can comprehensively meet information needs. Second, there is consistency; the innovations applied through the website still retain similarities that do not eliminate the characteristics/substance of previous innovations. Thirdly, there is complexity; this website adheres to the principle of simplicity and provides ease of use for users, resulting in a low level

of complexity. Then the fourth is tryability; besides containing information, this website provides various simple features, making it very likely to be tried by users. And lastly, there is ease of observation; although the information provided is quite extensive and comprehensive, it still makes it easy for users to read and understand it.

Although the website analysis and various literature reviews above show positive results, an interview with the Diskominfo of Karanganyar Regency stated otherwise. The government mentioned that there are challenges or obstacles felt in managing this website, such as technical errors due to signal disruptions, server incompatibility, and bugs in the website code. In addition, there are sometimes unexpected website maintenance activities that result in temporary service interruptions. As a result, this can reduce user comfort and trust in the website because it hinders them when they want to access the available information or services. Therefore, the author would like to recommend to the Karanganyar Regency Government to continuously monitor and evaluate the sustainability and maintenance of the website intensively so that this innovation can create optimal service continuity and enhance the competitiveness of Karanganyar's tourism.

This study acknowledges several limitations, particularly concerning the use of qualitative data from a single case and a relatively small number of interview participants, which may restrict the generalizability of its findings. The study's scope, focused on the regional area of Karanganyar, also limits the ability to compare findings with similar tourism platforms in other regions. Building upon these limitations, future research is advised to explore further areas of investigation. Suggested directions include conducting comparative studies with similar regional tourism platforms in other provinces to broaden the understanding of big data innovation. Additionally, it is recommended to employ a mixed-methods approach, integrating quantitative measures such as user analytics and satisfaction scores to triangulate and validate the qualitative findings. Further studies could also examine the long-term impact of big data-driven tourism governance on local economies and tourist behavior.

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