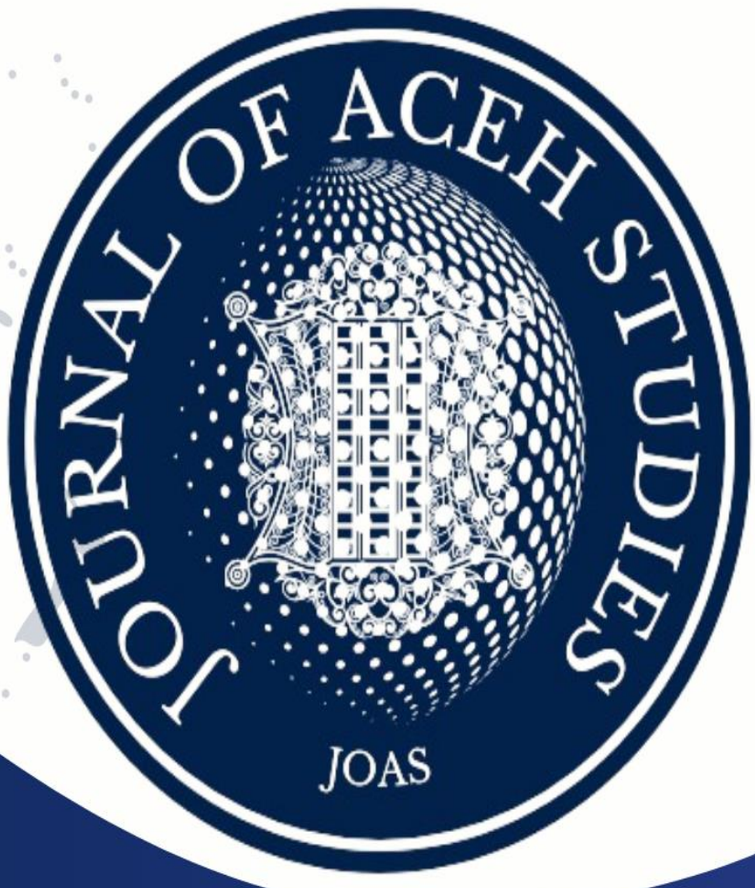
E-ISSN: 3032-4920
P-ISSN: 3046-7519

Journal of Aceh Studies

JOAS



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P-ISSN: 3046-7519

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JOURNAL OF ACEH STUDIES

The multidisciplinary journal of Aceh society

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ISSN 3032-4920
ISSN 3046-7519

JOURNAL OF ACEH STUDIES (JOAS)
The journal publishes research on Aceh and societies
Vol. 2 No. 2 July 2025 | E-ISSN: 3032-4920 | P-ISSN: 3046-7519

Digital Transformation in Tourism Village Governance: A Case Study of Nusa Village Using IPA and ANOVA

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Abstract

Background of the problem: The incorporation of digital technologies in rural tourism governance is essential for improving transparency, efficiency, and community involvement. Desa Wisata Nusa, situated in Aceh Besar, Indonesia, exemplifies a tourism town with significant potential for digital transformation under the Smart town paradigm. **Purpose**: This study seeks to evaluate the degree of digitalization in the governance of Nusa Tourism Village by examining stakeholder perspectives across three dimensions: Smart Governance, Smart Society, and Smart Economy. **Method**: A mixed-method approach was utilized, gathering data from 50 respondents embodying the Penta helix paradigm, which encompasses academics, business, community, government, and media. The research employed Importance Performance Analysis (IPA) to pinpoint areas necessitating enhancement and Analysis of Variance (ANOVA) to investigate perceptual disparities among stakeholder groups. **Result**: The findings reveal considerable differences in stakeholder perceptions across all parameters. The preparedness of the workforce for digital tourism has become a crucial issue necessitating urgent focus. Conversely, elements like digital marketing, operational efficacy, and availability of digital educational resources were seen as operating satisfactorily and should be preserved. **Implication:** The results underscore the significance of focused capacity enhancement and reinforced multi-stakeholder collaboration to facilitate sustainable digital governance in tourism communities. These results enhance the wider discussion on rural digitalization and provide actionable consequences for policy formulation and execution.

Keyword: Smart Village; Digital Governance; Tourism Village; Importance Performance Analysis; ANOVA

Article Info: Submitted 01/06/2025 | Revised 17/07/2025 | Accepted 20/07/2025 | Online first 23/07/2025

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https://doi.org/10.63924/joas.v2i2.242
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INTRODUCTION

Background of the Problem

Over the past few decades, digitalization has significantly transformed various sectors, including tourism. Information and communication technology (ICT) now plays a critical role in enhancing tourism promotion, data management, and visitor experiences (Salimah et al., 2023). This global trend is evident in the increasing use of digital interaction and social media as primary tools for shaping perceptions of tourist destinations.

Indonesia, aligning with this trend, has prioritized the development of tourism villages (desa wisata) as part of its national tourism strategy. Aceh Province, known for its rich cultural and natural tourism potential, has also initiated similar efforts. One notable example is Desa Wisata Nusa in Lhoknga District, Aceh Besar, which was selected among the Top 50 in the 2021 Anugerah Desa Wisata Indonesia (ADWI). The village showcases a variety of local attractions, including traditional culinary experiences, homestay accommodations, waste management initiatives, and disaster preparedness training (Munawir et al., 2023).

Despite its promising potential, the digitalization of tourism governance in Nusa Village remains suboptimal. There is a notable gap between policy frameworks and their actual implementation in the field. Many villages that have adopted digital tools—such as visitor databases, online booking features, and digital marketing platforms—still underutilize these systems. This results in operational inefficiencies and delays in decision-making processes.

To address these challenges, the Smart Village concept offers a relevant framework for evaluating how digitalization is integrated into tourism village governance. This study adopts three core dimensions of the Smart Village model: smart governance, smart society, and smart economy (Nuraini et al., 2021). These dimensions emphasize transparency, community empowerment, and digital-based economic innovation (Chiqmah & Choiriyah, 2022; Batuara et al., 2022).

Previous research has demonstrated the positive impacts of smart village and smart city implementations. For instance, Wahyuni et al. (2023) found that digital technologies contributed to improved transparency and the growth of creative industries in Bandung City. Similarly, Husna & Syaodih (2022), using the Importance–Performance Analysis (IPA) method, identified gaps between government performance and public expectations in Bogor Tengah. Felasari & Roychansyah (2019) observed the need to realign smart city initiatives in Surabaya with community priorities. These findings underscore the importance of aligning digital governance efforts with local contexts and stakeholder expectations.

Research Question

This study aims to assess the extent to which digitalization has been implemented in the governance of Desa Wisata Nusa by applying Importance–Performance Analysis (IPA) to evaluate priority areas, and Analysis of Variance (ANOVA) to identify perception gaps among key stakeholders. The research is guided by the following questions:

1. What is the current state of digitalization in the tourism governance of Desa Wisata Nusa?
2. What are the priority areas for enhancing digital governance based on the smart governance, smart society, and smart economy dimensions, as identified through IPA and ANOVA?
3. What recommendations can be proposed to improve digital tourism governance in Desa Wisata Nusa based on these three dimensions?

THEORETICAL FRAMEWORK

According to the Ministry of Culture and Tourism Regulation, a Desa Wisata (tourism village) is a unified entity that integrates accommodation, attractions, and supporting facilities within the everyday life of the community, which remains rooted in local traditions. Diwyarthi (2023) further emphasizes that tourism villages reflect the authenticity of rural areas through their culture, daily life, architecture, and spatial organization, which are offered as tourism experiences.

Digitalization is the process of transforming manual systems into technology-based operations, enabling improved access to services, information, and stakeholder interaction. In tourism village governance, digitalization serves several key functions: enhancing promotional efforts, improving visitor services, supporting data management, and increasing public participation (Mumtaz & Karmilah, 2021). Digital platforms facilitate more effective collaboration among

key stakeholders namely, village authorities, business actors, community members, and media, allowing for real-time communication and data sharing.

In this context, the Smart Village concept has emerged as a strategic framework to guide the digital transformation of rural areas. It emphasizes not only the integration of information and communication technology (ICT) but also the preservation of local wisdom and cultural identity (Widiyarta et al., 2024). The application of the Smart Village model in tourism development is centered on three interrelated dimensions (Cartika et al., 2024; Batuara et al., 2022):

- Smart Governance focuses on improving administrative efficiency, fostering transparency, and promoting inclusive stakeholder participation in village-level decision-making processes.
- Smart Society emphasizes the development of human capital through digital literacy, lifelong learning, and community empowerment, enabling local residents to actively engage in and benefit from digital transformation.
- Smart Economy aims to stimulate innovation, entrepreneurship, and creative industries by leveraging digital tools to enhance productivity, market access, and the economic resilience of local tourism enterprises.

These three pillars work synergistically to support a sustainable digital ecosystem in tourism villages. Empirical studies provide evidence of their impact. Wahyuni et al. (2023) demonstrated that the adoption of smart governance practices in Bandung significantly improved transparency and supported the growth of the creative economy. Similarly, Husna & Syaodih (2022), using the Importance–Performance Analysis (IPA) method in Bogor Tengah, identified a gap between government performance and public expectations in the area of smart governance. Felasari & Roychansyah (2019) highlighted the need for realignment in the implementation of smart city initiatives in Surabaya to better reflect community priorities.

To assess the implementation of digitalization in tourism village governance, this study applies the Importance–Performance Analysis (IPA) method. IPA enables researchers to compare the perceived importance of various attributes with their actual performance, revealing key gaps and helping to prioritize improvement efforts (Pradana et al., 2023). Complementing this, the Analysis of Variance (ANOVA) is used to evaluate whether significant differences in perception exist among stakeholder groups. This statistical approach supports the identification of perceptual variation based on respondents' institutional backgrounds, thus informing a more targeted governance strategy (Waluyo et al., 2024).

The theoretical framework integrates established concepts and methods to guide the assessment of digital governance in tourism villages. It not only provides a structured analytical lens but also offers actionable insights for strengthening the digital transformation of rural tourism systems.

METHOD

The data source for this study is a summary of questionnaire responses regarding the perceptions and expectations of respondents representing the Pentahelix elements, academics, business actors, communities, government, and the media, regarding the governance conditions of Nusa Tourism Village. The data collection process began with determining research dimensions and indicators, compiled based on literature reviews and the results of similar case studies.

The data for this study were obtained through a closed-ended questionnaire designed based on indicators from three dimensions: smart governance, smart society, and smart economy. The questionnaire was structured using a 5-point Likert scale and consisted of two assessment sections: perceptions and expectations. The questionnaire was distributed to 50 respondents selected using quota sampling, proportionally representing the five elements of the Pentahelix. Distribution was conducted online via Google Forms. The indicators for each dimension used in this study are presented in Table 1.

Table 1: Questionnaire Statement Indicators

No	Dimension	Indicator	Statement
1	Smart Governance	Participation in decision making	**P1.** A digital platform is available for the public to express opinions on the governance of Desa Wisata Nusa. **P2.** Stakeholders (community, business, academia, government, and media) are involved in decision-

No	Dimension	Indicator	Statement
			making related to the development of village governance, conducted through online media such as websites and/or social media.
		Transparent Governance	**P3.** Digital media is available to communicate governance-related information of Desa Wisata Nusa, accessible to the public. **P4.** Program, activity, and governance information is openly shared via online media such as websites or social media.
		Public and Social Service	**P5.** Desa Wisata Nusa provides a digital platform for the community and tourists to submit requests or complaints related to public services. **P6.** Digital guides are available to help residents and tourists access public facilities such as health services, places of worship, and the village office.
2	Smart Society	Education System and Facilities	**P7.** Digital education facilities such as webinars or online training are available to improve community skills in tourism. **P8.** The community has adequate access to digital training to improve skills in tourism governance.
		Creativity	**P9.** The community uses digital technology to create creative content such as videos or photos to promote tourism destinations. **P10.** A digital platform is available for the community to showcase creative works such as handicrafts, arts, or local culture to tourists.
3	Smart Economy	Innovative Spirit	**P11.** Local entrepreneurs use digital technology such as tourism apps, reservation platforms, or social media to develop and market tourism products. **P12.** Desa Wisata Nusa actively innovates by using digitalization to optimize its tourism potential.
		Entrepreneurship	**P13.** Local entrepreneurs use digital platforms such as social media and e-commerce for promoting tourism products and services. **P14.** Online entrepreneurship training such as website development and digital marketing is available to the community.
		Economy Image and Trademarks	**P15.** Desa Nusa builds a strong image as a tourism destination through digital promotion of its official logo, tourism slogan, and online testimonials. **P16.** The government actively promotes the village's distinctive tourism products through social media and tourism websites.
		Flexibility of Labour Market	**P17.** The village workforce is capable of adapting their skills to the needs of digital tourism, such as marketing or online booking. **P18.** The tourism village provides digital-based employment opportunities for the community, including e-commerce, digital marketing, and management of online tourism platforms.
		Productivity	**P19.** Digital technology enhances the productivity of tourism business actors in marketing, online booking, and resource management.

No	Dimension	Indicator	Statement
			P20. Digitalization accelerates operational processes such as inventory management, thereby increasing time efficiency and reducing errors.

Data processing began with an instrument feasibility test, which included both validity and reliability assessments. Once the instrument was confirmed to be valid and reliable, prerequisite tests for ANOVA were conducted-namely, tests for normality and homogeneity. The normality test was used to ensure that the sample data were drawn from a normally distributed population. A significance value (Sig.) greater than 0.05 indicates that the data are normally distributed (Kismono & Dewi, 2021). Meanwhile, the homogeneity test was conducted to determine whether the variance among groups was equal. If the significance value exceeds 0.05, the data are considered homogeneous (Usmadi, 2020; Zulkifli et al., 2025).

Subsequently, a One-Way ANOVA was applied to assess whether there were statistically significant differences among respondent groups. In cases where significant differences were found, a Post Hoc test was conducted to identify the specific groups that differed. Additionally, the Importance–Performance Analysis (IPA) method was employed to compare respondents' perceptions and expectations regarding the digital governance of Desa Wisata Nusa. The results of this comparison were then mapped onto an IPA matrix to determine which attributes should be maintained and which require improvement.

FINDING AND DISCUSSION

Respondent Profile

Based on the distribution of the questionnaire, a total of 50 respondents participated in this study. All respondents (100%) reported being aware of the existence of Desa Wisata Nusa. In terms of educational background, the majority held a senior high school diploma or its equivalent (25 respondents), followed by those with a bachelor's degree (14 respondents), a master's degree (9 respondents), and a doctoral degree (3 respondents). None of the participants had an education level below high school. Regarding occupational background, the respondents were evenly distributed across the five elements of the Penta helix model, with 10 individuals representing each stakeholder group: academics/researchers, business/industry actors, community members, government representatives, and media professionals.

Validity and Reliability Test

The instrument testing in this study was conducted to ensure the accuracy of the data through validity and reliability assessments. The validity test was used to evaluate how effectively the instrument measured data that are relevant and aligned with the research objectives (Said et al., 2023). Meanwhile, the reliability test assessed the consistency of the instrument, specifically its ability to produce stable results when administered repeatedly (Azzahra, 2023).

Table 2 presents the results of the instrument validity test using SPSS. The results indicate that all questionnaire items across each dimension are considered valid, as their calculated r values exceed the critical r table value, in accordance with established validity criteria (Rasmanna et al., 2023). Thus, all items in the questionnaire are deemed appropriate for measuring the variables in this study.

Subsequently, Table 3 presents the results of the instrument reliability test conducted using SPSS. The results indicate that all dimensions, both performance and importance, are considered reliable, as they yield Cronbach's Alpha values greater than 0.6. Therefore, the questionnaire is deemed reliable and suitable for use in this study.

Table 2: Validity Test Results

No	Dimensions	Code	Performance	Importance	R Tabel	Result
1	Smart Governance	P1	0,734	0,659	0,279	Valid
		P2	0,758	0,667	0,279	Valid
		P3	0,458	0,510	0,279	Valid
		P4	0,581	0,554	0,279	Valid
		P5	0,763	0,499	0,279	Valid
		P6	0,764	0,712	0,279	Valid
2	Smart Society	P7	0,641	0,916	0,279	Valid
		P8	0,766	0,824	0,279	Valid

		P9	0,614	0,886	0,279	Valid
		P10	0,712	0,904	0,279	Valid
3	Smart Economy	P11	0,608	0,663	0,279	Valid
		P12	0,520	0,378	0,279	Valid
		P13	0,708	0,678	0,279	Valid
		P14	0,424	0,358	0,279	Valid
		P15	0,500	0,338	0,279	Valid
		P16	0,621	0,567	0,279	Valid
		P17	0,540	0,537	0,279	Valid
		P18	0,771	0,483	0,279	Valid
		P19	0,605	0,515	0,279	Valid
		P20	0,369	0,318	0,279	Valid

Table 3: Reliability Test Results

No	Dimension	*Cronbach's Alpha*		*N of Items*	Results
		Performance	Importance		
1	Smart Governance	0,774	0,644	6	Reliable
2	Smart Society	0,623	0,902	4	Reliable
3	Smart Economy	0,769	0,641	10	Reliable

ANOVA

In conducting ANOVA analysis, two initial assumptions must be met: the normality test and the homogeneity test. The normality test is used to verify that the sample data are drawn from a population with a normal distribution, while the homogeneity test aims to assess whether the variances across data groups are equal.

Table 4 presents the results of the normality test conducted using SPSS. All Penta helix stakeholder groups across the three dimensions yielded significance values greater than 0.05. A significance value (Sig.) > 0.05 indicates that the sample variances are not significantly different, and thus, the data are considered homogeneous (Usmadi, 2020; Zulkifli et al., 2025). These results confirm that the data are normally distributed, and the normality assumption is fulfilled, allowing the ANOVA analysis to proceed.

Subsequently, Table 5 presents the results of the homogeneity test conducted using SPSS. The significance values (p-values based on mean) for all dimensions were greater than 0.05, indicating that the variances across respondent groups are homogeneous. Therefore, the assumption of homogeneity of variance has been met, allowing the ANOVA analysis to be conducted appropriately.

Table 4: Normality Test Results

Penta helix		Shapiro-Wilk		
		Statistic	df	*Sig.*
Smart Governance	Academia/researcher	0,872	10	0,106
	Business	0,923	10	0,383
	Community	0,884	10	0,144
	Government	0,928	10	0,425
	Media	0,967	10	0,860
Smart Society	Academia/researcher	0,934	10	0,487
	Business	0,952	10	0,691
	Community	0,955	10	0,732
	Government	0,910	10	0,283
	Media	0,878	10	0,124
Smart Economy	Academia/researcher	0,949	10	0,652
	Business	0,875	10	0,113
	Community	0,973	10	0,915
	Government	0,873	10	0,107
	Media	0,913	10	0,301

**. This is a lower bound of the true significance.*
a. Lilliefors Significance Correction

Table 5: Homogeneity Test Results

Test of Homogeneity of Variances					
		Levene Statistic	**df1**	**df2**	***Sig.***
Smart Governance	Based on Mean	1,030	4	45	0,402
	Based on Median	0,962	4	45	0,438
	Based on Median and with adjusted df	0,962	4	40,728	0,439
	Based on trimmed mean	1,040	4	45	0,397
Smart Society	Based on Mean	0,586	4	45	0,674
	Based on Median	0,376	4	45	0,825
	Based on Median and with adjusted df	0,376	4	40,329	0,824
	Based on trimmed mean	0,553	4	45	0,698
Smart Economy	Based on Mean	2,094	4	45	0,097
	Based on Median	1,550	4	45	0,204
	Based on Median and with adjusted df	1,550	4	35,035	0,209
	Based on trimmed mean	2,004	4	45	0,110

Table 6 presents the results of the ANOVA test conducted on the three dimensions of the Smart Village framework. The significance values for each dimension were below 0.05 ($p < 0.05$), indicating statistically significant differences in mean scores among the respondent groups for each dimension. Given these significant differences, the analysis was further extended with a Post Hoc test to identify which specific groups differed.

Table 6: One Way ANOVA

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Smart Governance	Between Groups	261,080	4	65,270	9,405	0,000
	Within Groups	312,300	45	6,940		
	Total	573,380	49			
Smart Society	Between Groups	27,880	4	6,970	3,369	0,017
	Within Groups	93,100	45	2,069		
	Total	120,980	49			
Smart Economy	Between Groups	179,320	4	44,830	3,748	0,010
	Within Groups	538,300	45	11,962		
	Total	717,620	49			

The Post Hoc test results revealed significant differences in perceptions among the Penta Helix groups regarding the three dimensions of smart village development in Desa Wisata Nusa, namely smart governance, smart society, and smart economy.

In the smart governance dimension, the academics/researchers group showed significant differences in perception compared to the business actors and community members (Sig. < 0.05), but no significant difference was found compared to the government and media groups (Sig. > 0.05). Business actors also differed significantly from the media group, but not from the government and community groups. Meanwhile, community members displayed significant differences with the media group, but not with the government.

In the smart society dimension, the most notable difference in perception was observed between academics/researchers and business actors, while the other groups, community, government, and media, demonstrated relatively consistent views.

In the smart economy dimension, academics/researchers significantly differed from community members, and community members also differed significantly from the government. However, no significant differences were observed between the community and business actors

or the media. The business actors, government, and media groups tended to share similar perceptions.

These findings reflect a diversity of perceptions, particularly among academics, business actors, and community members, in evaluating the implementation of digital transformation in Desa Wisata Nusa, whereas the other groups exhibited more consistent and aligned viewpoints.

IMPORTANCE PERFORMANCE ANALYSIS (IPA)

Level of Respondents' Satisfaction Suitability

The measurement of respondents' satisfaction suitability was conducted by comparing perceptions with expectations. This comparison aims to determine the extent to which the digital governance in Desa Wisata Nusa has met the expectations of respondents from the Penta Helix categories.

Based on the suitability level calculations, several statements exhibited a high level of suitability, such as P16 regarding government promotion of tourism products through social media (99.408%), P20 concerning the acceleration of operations through digitalization (99.167%), and P19 about the contribution of technology to the productivity of tourism business actors (95.588%). These findings indicate that these aspects have been implemented very well and are almost fully aligned with respondents' expectations.

Conversely, there were statements with low suitability levels, such as P5 concerning the availability of a digital platform for submitting complaints (70.854%) and P6 regarding digital guides for access to public facilities (71.277%). These gaps suggest the need for improvements in digital-based public services. Overall, the suitability level obtained was 85.355%. This indicates that although the implementation of digitalization in the governance of Desa Wisata Nusa is relatively good, there remain several aspects that require enhancement to fully meet respondents' expectations.

Importance Performance Analysis Matrix

The use of the Importance Performance Analysis (IPA) matrix aims to identify attributes that need to be maintained and improved based on the comparison between respondents' perception levels and expectations. Figure 1 presents the Cartesian diagram of the Importance Performance Analysis matrix. The Cartesian diagram shows that one statement falls within Quadrant I (primary priority), twelve statements are positioned in Quadrant II (maintain performance), six statements in Quadrant III (low priority), and one statement in Quadrant IV (excessive).

In Quadrant I, the capability of the village workforce to adapt their skills to the needs of digital tourism (P17) emerges as the foremost priority requiring immediate improvement. The low perception of this attribute indicates the need for enhancements such as the provision of digital training programs, improved access to technological literacy, and infrastructural support. These efforts are essential to enable the local human resources to compete and contribute effectively to the development of digitally-based tourism. Capacity-building initiatives and training are crucial to help the community in Desa Nusa align their skills with the evolving demands of digital tourism governance, thereby optimally supporting the progress and competitiveness of Desa Wisata Nusa.

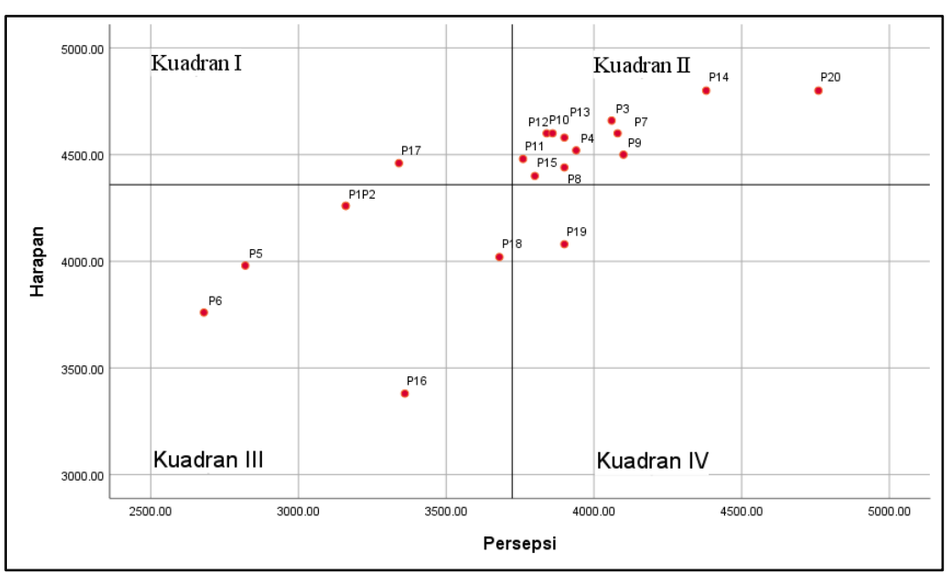

Figure 1: Cartesian Diagram

The attributes located in Quadrant II have demonstrated good performance and should be maintained. The success in utilizing digital platforms by local business actors, transparency of information, provision of digital training, and the formation of tourism business groups reflect a relatively successful initial implementation of digitalization. To sustain these achievements, consistent monitoring and strengthening of innovation are necessary, ensuring that these advantages are not merely temporary. Maintaining these attributes is a crucial step in preserving the quality of digital-based governance in Desa Wisata Nusa.

In Quadrant III, although current levels of performance and importance remain low regarding aspects such as digital stakeholder engagement, online complaint submission, and government-led digital promotion, these issues should not be overlooked. The village government needs to conduct regular evaluations and implement outreach strategies to gradually increase public participation and the quality of digital services. Readiness for future demands must be fostered from an early stage. With appropriate governance strategies, Desa Wisata Nusa can strengthen its digital-based management, thereby enhancing the quality of public services and optimizing community involvement.

For Quadrant IV (Excessive), the allocation of resources toward aspects perceived as performing well but considered lower priority, such as attribute P19, which relates to the use of digital technology to enhance the productivity of tourism business actors, particularly in marketing, online booking, and resource management, should be reassessed. Although the implementation is deemed optimal, excessive focus on this attribute may reduce the overall effectiveness of management. Therefore, adjustments are necessary to redirect development efforts toward aspects that are more urgently needed and have a more significant impact on advancing the governance of Desa Wisata Nusa.

CONCLUSION

Based on the research objectives and the results of the analysis conducted, it can be concluded that the digitalization of tourism governance in Desa Wisata Nusa demonstrates a fairly good implementation in several aspects, particularly in the utilization of technology for tourism promotion and digital training for the community. However, challenges remain that need to be addressed, such as limited access to digital services, low community participation through online platforms, and suboptimal processes in decision-making and digital-based public services.

Findings from the ANOVA analysis reveal significant differences in perceptions among the Penta Helix groups, indicating the need for stronger collaboration to support the enhancement of village governance based on the Smart Governance, Smart Society, and Smart Economy approaches. Meanwhile, the Importance-Performance Analysis (IPA) indicates that perceptions regarding the statements across these three dimensions fall into all four IPA quadrants, reflecting a variation between actual performance and the perceived importance of certain aspects.

In the Smart Governance dimension, aspects related to information transparency and ease of data access have been implemented well and are considered important by respondents; however, this dimension still requires strengthening in terms of consistency. The Smart Society dimension shows performance aligned with expectations but still requires periodic evaluation to remain in tune with the dynamic tourism industry. In the Smart Economy dimension, labor market flexibility is identified as a critical area requiring immediate improvement, as it holds high importance but exhibits low performance.

Therefore, to advance the digitalization of governance in Desa Wisata Nusa, several strategies are necessary, including improving access to and quality of digital media, expanding digital training programs, developing efficient online public services, strengthening the village's digital identity through consistent branding, and fostering more intensive and sustainable synergy among the Penta Helix elements.

DECLARATION OF CONFLICTING INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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