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THE INTERPLAY OF PERCEPTION, BELIEF, AND SOCIOECONOMIC FACTORS IN BOROBUDUR FOR THE SUSTAINABILITY OF SMART TOURISM VILLAGES, INDONESIA

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Abstract: Tourism is evolving, and the integration of technology for sustainable development has become increasingly crucial, especially for heritage sites like Borobudur. These sites must balance cultural preservation with the demands of economic growth. Understanding the factors that influence the sustainability of smart tourism villages is essential to ensure these destinations remain viable and sustainable over the long term. This study investigates the interplay of perception, belief, and socioeconomic factors in shaping the sustainability of smart tourism villages in Borobudur using an explanatory quantitative design with a survey approach. Data were collected from 182 participants via online questionnaires, and statistical methods, including CFA, ANCOVA, mediation, and moderation analyses, were used to explore variable relationships. The results reveal that perception (β = 0.0810, p = .4068) does not significantly influence sustainability, while belief (β = 0.1634, p = .0183) plays a key mediating and moderating role, strengthening the perception-sustainability relationship (Int_1 = 0.0376, p = .0371). Demographic factors such as gender (β = 0.3857, p = .5955) and age (β = 0.3037, p = .4935) are not significant predictors, whereas socioeconomic status (β = -0.2309, p = .0046) and job (β = -0.1976, p = .0286) significantly moderate the relationship, indicating that higher socioeconomic status and certain jobs weaken the perception-belief-sustainability link. These findings emphasize the significance of both psychological and demographic factors in smart tourism sustainability, suggesting that targeted strategies are necessary to improve sustainability awareness among diverse socioeconomic and occupational groups, thereby supporting sustainable tourism development in Borobudur.

Keywords: Borobudur, demographics, multifaceted, psychology, smart tourism village, socioeconomic, sustainability

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INTRODUCTION

Sustainable tourism has garnered global attention as a strategy to reconcile economic development with environmental conservation (Papathanassis et al., 2017). Smart tourism villages, which integrate digital innovation, local wisdom, and sustainable practices, have emerged as a promising model for revitalizing rural economies.

These villages leverage digital technologies to enhance tourism experiences while fostering environmental sustainability and community well-being (Zhang, 2018). In the case of the Borobudur area, a UNESCO World Heritage site, the implementation of smart tourism villages is anticipated to not only boost local livelihoods but also contribute to the preservation of cultural heritage (Ristiawan, 2020). Sustainable tourism initiatives, including the implementation of smart tourism villages, have been evaluated in various regions, with positive outcomes in terms of economic revitalization and cultural preservation. Data from pilot projects and case studies in similar rural settings demonstrate the potential of these initiatives to enhance local livelihoods and contribute to sustainable tourism practices (Amiruddin et al., 2024; Amrullah et al., 2023). In the case of Borobudur, preliminary research data evaluating the success of smart tourism village initiatives indicates an increase in community engagement and a measurable impact on local economic development, particularly in tourism-related activities. However, the success of these initiatives depends on various factors, particularly the perceptions and beliefs of local communities regarding sustainability and the socioeconomic conditions that influence their participation in tourism activities (Hariyadi et al., 2024). Sustainable tourism focuses on promoting practices that balance environmental conservation and economic development, ensuring that current tourism needs do not compromise future generations' ability to meet theirs. With the rise of digital technologies, smart tourism has gained attention as a tool to enhance tourist experiences, improve efficiency, and promote sustainability through ICT, big data analytics, and smart governance (Almasari & Rachmawati, 2023; Rudwiarti et al., 2021).

However, the success of smart tourism depends not only on technological infrastructure but also on local community perceptions and beliefs. In rural areas like Borobudur, where tourism development is closely tied to community participation, understanding how local residents perceive the benefits and risks of smart tourism is crucial (Amiruddin et al., 2024). These perceptions play a key role in determining the long-term sustainability of smart tourism villages,

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highlighting the need for socially and culturally inclusive approaches alongside technological advancements (Flores-Crespo et al., 2022). Despite extensive research on sustainable tourism Pham Hong et al. (2021) and smart tourism applications (Hsu, 2018), limited studies have examined the interplay between individual perceptions, beliefs, and socioeconomic factors in shaping the sustainability of smart tourism villages. Existing literature has largely focused on technological innovations and policy frameworks for implementing smart tourism (Panasiuk, 2019; Pham Hong et al., 2021), often emphasizing digital infrastructure, big data analytics, and smart governance as key determinants of sustainability.

While these studies provide valuable insights into the operational and technological dimensions of smart tourism, they overlook the human and social dimensions, which are crucial in determining the long-term viability of these initiatives. In rural contexts like Borobudur, where tourism development is closely linked to community participation and local economic conditions, the sustainability of smart tourism villages cannot be fully understood without considering how local residents perceive and believe in the benefits of such initiatives.

Furthermore, previous studies on socioeconomic impacts of tourism have primarily explored macroeconomic indicators such as employment rates and income generation (Bramwell & Lane, 2011; Getahun, 2017), but have not sufficiently addressed how individual socioeconomic circumstances, including employment status and financial stability, influence perceptions and engagement in sustainable tourism. This gap is significant because community engagement is not only shaped by objective economic factors but also by subjective attitudes, trust, and perceived benefits of tourism development (Jackson et al., 2018). In regions where economic uncertainty prevails, individuals with unstable employment may perceive smart tourism initiatives as less viable or sustainable, affecting their willingness to participate. Likewise, economic disparities within a community can lead to divergent perceptions and beliefs, potentially hindering collective support for sustainability efforts. By integrating mediation-moderation analysis, this study aims to fill this research gap by providing a comprehensive understanding of how individual and structural factors interact to influence the sustainability of smart tourism villages in the Borobudur area. The novelty of this study lies in its exploration of the direct and indirect relationships between perception, belief, and sustainability in the context of smart tourism, particularly in the Borobudur area. While previous research has examined these factors individually, few studies have investigated their interconnectedness, especially in relation to the moderating effects of employment status and economic conditions. This study fills a gap by integrating these dimensions, offering a comprehensive understanding of how local perceptions and socioeconomic factors shape the sustainability of smart tourism villages in a rural setting. By employing a mediation-moderation analysis, this research provides deeper insights into the interplay between individual and structural factors in determining the sustainability of smart tourism villages.

The study aims to, (1) analyze the direct influence of perception and belief on sustainability, (2) investigate the mediating and moderating role of key variables in this relationship, and (3) examine the moderating effects of employment status and economic conditions. The findings will contribute to both theoretical advancements in sustainable tourism research and practical implications for policymakers and tourism stakeholders in optimizing smart tourism village initiatives.

LITERATURE REVIEW

Perception and belief of Smart Tourism Village

The concept of a Smart Tourism Village (STV) has been gaining significant attention in the field of tourism and sustainable development. It combines traditional tourism principles with digital innovations to enhance the overall tourism experience while ensuring environmental sustainability. The perception of this concept by local communities and tourists is vital to its success. According to Sabarguna (2022), smart tourism incorporates advanced technologies to create a more personalized, efficient, and accessible experience for tourists. The perception of these innovations can significantly affect their acceptance and integration within the local context. Beliefs about the benefits of STVs often align with how local communities perceive the value of integrating technology into tourism. A study by Kusumastuti et al. (2024) emphasized that positive local perceptions of technology's role in enhancing the destination's appeal, management, and visitor satisfaction are essential for the sustainability of STVs. Communities that view the technology as a tool for improving their socio-economic conditions are more likely to adopt and promote smart tourism practices. On the other hand, resistance to change may emerge in regions where people believe that technology may erode traditional cultural practices and values (He et al., 2012; Kusumastuti et al., 2024). This indicates that belief systems and perceptions about the integration of technology in tourism not only influence the community's willingness to embrace smart tourism models but also shape the sustainability of these initiatives.

Sustainability of Smart Tourism Village

Sustainability, in the context of tourism, is defined as the ability to support long-term economic, social, and environmental goals without depleting resources or causing harm to the local culture (Rudwiarti et al., 2021). A Smart Tourism Village (STV) is expected to promote sustainable practices by integrating technological solutions that minimize environmental footprints, optimize resource usage, and foster economic inclusivity. The concept of sustainability within STVs involves maintaining a delicate balance between technological advancement, local culture, and the natural environment. Environmental sustainability in STVs is largely achieved through the implementation of smart infrastructure, such as energy-efficient buildings, waste management systems, and eco-friendly transport solutions (Qi et al., 2020). These technologies can drastically reduce the negative impact of tourism on natural resources, ensuring that the environmental integrity of the destination is preserved for future generations. Moreover, tourism technologies can facilitate better management of tourist flows, reducing overcrowding and environmental degradation.

From an economic sustainability perspective, STVs encourage the creation of job opportunities, promote local entrepreneurship, and enhance the livelihoods of communities involved in the tourism sector. By utilizing digital platforms, local businesses can gain wider exposure and access to global markets, which increases their revenue potential (Prastya et al., 2022). Furthermore, the economic benefits of STVs can be more evenly distributed, fostering socio-economic equality by providing benefits to traditionally marginalized groups (Dembovska et al., 2023).

However, achieving such benefits requires strong local governance, adequate infrastructure, and a commitment to equitable practices, which are not always guaranteed in developing regions. Social sustainability within STVs is achieved through fostering a sense of ownership, identity, and participation among local communities (Halim et al., 2023). For an STV to thrive sustainably, it is essential that the local population feels involved and empowered in the decision-making processes regarding tourism management and the adoption of technological solutions.

Without local buy-in, the implementation of smart technologies may fail to meet the needs of the community and lead to disenfranchisement, which can disrupt the social fabric of the destination.

Socioeconomic view of Smart Tourism Village

The socioeconomic impact of STVs is profound, as these initiatives can significantly alter the economic landscape of rural communities. While the potential economic benefits are considerable, they are often contingent upon the community's readiness to adapt to new technologies and integrate them into their livelihoods. As highlighted by Pranita et al. (2021), STVs hold the potential to promote inclusive growth by offering local communities new economic opportunities, diversifying income sources, and creating an environment conducive to entrepreneurship. The introduction of digital tools and platforms enables small local businesses to connect with tourists globally, providing a broader market for their products and services.

However, the socioeconomic impact also depends on how the community and local government manage the integration of technology within their economic systems. According to Dembovska et al. (2023); Kusumastuti et al. (2024), the benefits of STVs may be unevenly distributed, especially in areas where there is a significant digital divide. Socioeconomic inequality, in this case, can result in some members of the community being excluded from the benefits of smart tourism. To mitigate these disparities, it is essential for policymakers to ensure that adequate digital infrastructure, skills development, and training are provided to all community members, ensuring that no one is left behind in the digital transition.

Additionally, the introduction of smart technologies in tourism can have indirect socioeconomic benefits, such as improving access to education and healthcare in remote areas. Technologies like telemedicine, e-learning platforms, and mobile banking can significantly improve the quality of life for local residents (Li & Zhong, 2022).

These innovations can be particularly valuable in rural and underserved regions, where traditional infrastructure may be lacking, thereby enhancing the overall socioeconomic development of the area.

Conjecture of Study

The sustainability of Smart Tourism Villages (STVs) is an emerging area of research that is largely underexplored, particularly in the context of Borobudur, Indonesia. Given its historical significance and its current role as a major tourist destination, understanding the interplay of perception, belief, and socioeconomic factors is crucial for determining how well the STV concept can be implemented and sustained in this unique setting. This study aims to investigate the perceptions and beliefs of both the local community and tourists regarding the implementation of smart tourism technologies in Borobudur, as well as the socioeconomic impacts that such technologies may bring to the region.

The study will focus on understanding how local perceptions of technology influence their acceptance or resistance to its implementation, and how these perceptions can shape the success or failure of STV initiatives. It will also examine the ways in which belief systems, including cultural and religious values, intersect with technological adoption and the degree to which these beliefs either facilitate or hinder sustainable development in the village. Furthermore, the research will explore the socioeconomic consequences of introducing smart technologies to Borobudur, specifically in terms of economic growth, employment opportunities, and social inclusion. By evaluating the integration of technology into the region's tourism infrastructure, the study will aim to uncover how such initiatives can foster sustainable socioeconomic development while maintaining cultural authenticity. Ultimately, this study seeks to contribute to the broader discourse on sustainable tourism development, providing a case study for how smart tourism practices can be adapted and integrated into local settings, particularly in culturally rich and historically significant destinations such as Borobudur.

METHOD

Research Design

This study employs an explanatory quantitative research design using a survey approach with a structured questionnaire as the primary data collection instrument (Hair et al., 2019). This design enables a systematic measurement of key variables and the application of appropriate statistical analyses to address the research questions. The primary focus of this study is to examine the role of perception and belief in shaping the sustainability of smart tourism villages in the Borobudur area.

Mediation and moderation analyses are employed to explore the complex interactions between individual perceptions, beliefs, and socioeconomic factors, particularly employment status and financial stability. By utilizing multivariate statistical analysis, this study provides a deeper understanding of how these factors interact in influencing community engagement in sustainable tourism (Maulyda et al., 2025). The findings will offer valuable insights for policymakers and tourism stakeholders in optimizing smart tourism village initiatives, ensuring a balance between economic development and cultural preservation in rural tourism contexts. Detail of research design shows in Figure 1.

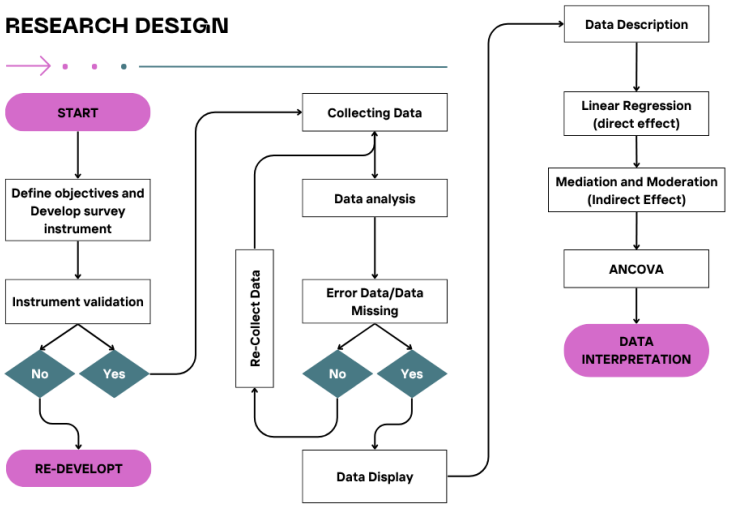

Figure 1. Research Design Flow Chart

Participant

This study involved 182 participants residing in the Borobudur tourism area, selected using random sampling to ensure a diverse representation of demographic characteristics, including gender, age, and socioeconomic status. Participants were chosen randomly from the local population and tourist groups within the region to ensure that the sample accurately reflects the broader community and visitor base, thereby enhancing the generalizability of the findings (Creswell, 2014). Participants consisted of local community members engaged in or affected by smart tourism initiatives. Prior to data collection, informed consent was obtained to ensure voluntary participation.

Data were collected through structured surveys distributed via Google Forms, capturing perceptions, beliefs, and socioeconomic factors, including employment status and financial stability. These variables were analyzed using mediation-moderation analysis to assess their impact on the sustainability of smart tourism villages.

Table 1. Demographics data of Participant (Source: Research Data)

	Aspect	Amount	Percentage (%)
Gender	Male	92	50.55
	Female	90	49.45
Age	18-25 years old	70	38.46
	26-35 years old	56	30.77
	> 36 years old	56	30.77
SES	Low	62	34.07
	Middle	54	29.67
	High	66	36.26
Job	Employee	85	46.70
	Unemployment	97	53.30

Table 1 presents the demographic characteristics of the study participants. A total of 182 individuals participated, with a nearly balanced gender distribution of 50.55% male and 49.45% female. In terms of age, most respondents were between 18 and 25 years old (38.46%), while the remaining participants were evenly distributed between the 26–35 age group (30.77%) and those older than 36 years (30.77%). Socioeconomic status (SES) was categorized into three levels: low (34.07%), middle (29.67%), and high (36.26%). Regarding employment status, 46.70% of participants were employed, while 53.30% were unemployed. These demographic factors provide essential insights into the diverse backgrounds of the respondents, contributing to a comprehensive analysis of how individual perceptions, beliefs, and socioeconomic conditions influence the sustainability of smart tourism villages. Visualization of data demographics shows in the Figure 2.

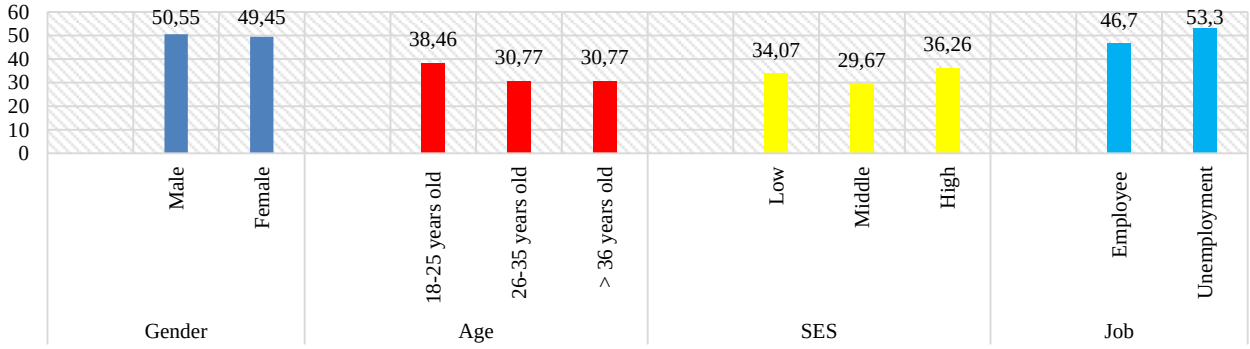

Figure 2. Visualization of Data Demographics

Measurement: this study employs a structured questionnaire as the primary data collection instrument. The questionnaire is designed to measure key variables related to the sustainability of smart tourism villages in the Borobudur area, particularly focusing on perception, belief, and their interplay with socioeconomic factors such as employment status and financial stability. The instrument is adapted from well-established scales in tourism and psychology to ensure validity and reliability in assessing individual and structural influences on sustainable tourism participation.

Perception: in this study, the researcher adapted the "Perception of Smart Tourism Village" instrument based on frameworks used in digital tourism research (Pham Hong et al., 2021; Wu et al., 2024). The questionnaire consists of four primary dimensions, with each dimension containing multiple items to assess the perceptions of local communities regarding the impact of smart tourism technologies on their experiences and the overall sustainability of tourism in the Borobudur area. The instrument includes a total of 15 items, which focus on the quality of digital information, technology infrastructure, user interaction, and tourism services. The specific dimensions and example items for each dimension are provided in Table 2 below.

Belief: the instrument was developed to measure key dimensions related to community beliefs of the economic, social, and personal benefits of smart tourism. The modified version consists of three primary dimensions: Economic Benefits, Improved Quality of Life, and Security and Privacy. Each dimension includes five items, totaling 15 items across the instrument. The Economic Benefits dimension assesses participants' beliefs about how smart tourism contributes to local economic development, which is crucial for understanding the potential of smart tourism to revitalize rural areas (Hariyadi et al., 2024). The Improved Quality of Life dimension measures participants' perceptions of how smart tourism initiatives enhance their overall living standards, reflecting the social sustainability aspect of these projects (Bramwell & Lane, 2011). The Security and Privacy dimension evaluates concerns regarding personal information security within digital tourism initiatives, which has become increasingly relevant as digital innovations shape the tourism landscape. The details of this instrument are provided in Table 3 below.

Table 2. Perception of Smart Tourism Village Instrument (Source: Modification of Pham Hong et al., 2021; Wu et al., 2024)

No	Dimenssion	Item	Example
1	Quality of Digital Information	1-5	The digital information provided about the smart tourism village is accurate and up to date.
2	Technology Infrastructure	6-10	The available digital infrastructure (Wi-Fi, mobile applications) enhances my tourism experience.
3	User Interaction	11-13	I find it easy to interact with digital platforms to access tourism-related services.
4	Tourism Services	14-15	The integration of smart technology improves the efficiency of tourism services in the village.
Total		**15**	

Tabel 3. Beliefs of Smart Tourism Village Instrument (Source: Modification of Hariyadi et al., 2024; Bramwell & Lane, 2011)

No	Dimenssion	Item	Example
1	Economic Benefits	1-5	Smart tourism contributes to local economic growth.
2	Improved Quality of Life	6-10	Smart tourism enhances my overall quality of life.
3	Security and Privacy	11-15	I feel that my personal information is secure in the smart tourism initiatives.
Total		**15**	

Tabel 4. Sustainability of Smart Tourism Village Instrument (Source: Adaptation of Bramwell & Lane, 2011)

No	Dimenssion	Item	Example
1	Environmental Sustainability	1-5	I believe that smart tourism initiatives will help preserve local ecosystems.
2	Social Sustainability	6-10	I think that the community will benefit socially from the development of smart tourism.
3	Economic Sustainability	11-15	I feel that smart tourism can create more job opportunities for local people.
Total		**15**	

Sustainability: this instrument consists of three main dimensions, each containing five items, for a total of 15 items. The dimensions include Environmental Sustainability, Social Sustainability, and Economic Sustainability, which are critical factors in understanding the viability and long-term success of smart tourism initiatives (Ristiawan, 2020). The instrument was tested for reliability and yielded an average reliability score of 0.90, indicating high internal consistency.

The items were specifically tailored to assess the respondents' perceptions of how smart tourism could impact their local environment, society, and economy. For example, items under Environmental Sustainability explore participants' beliefs about the role of smart tourism in preserving local ecosystems. Social Sustainability items focus on how respondents view the social benefits of tourism development, such as improved community well-being and social cohesion. Lastly, Economic Sustainability examines perceptions of job creation and economic development through smart tourism practices (Bramwell & Lane, 2011). The details of the instrument are outlined in Table 4 below:

While the questionnaire is primarily distributed electronically through email and online survey platforms to ensure accessibility and broad participation, we recognize that some members of the population may have limited access to digital technologies. To account for this, we will also provide paper-based surveys at local community centers and tourism-related venues to ensure inclusivity. This mixed-method approach will help ensure that both digitally connected individuals and those without digital access can participate, thus improving the representativeness and reliability of the study's findings. Data collection is conducted over a three-month period, targeting individuals involved in or affected by smart tourism village initiatives in the Borobudur area. Statistical analyses, including mediation-moderation analysis, are employed to examine the direct and indirect relationships between perception, belief, and sustainability, while considering the moderating effects of socioeconomic status and employment stability. This methodological approach allows for a comprehensive understanding of the complex interactions shaping the sustainability of smart tourism villages.

Data Analysis

To examine the relationship between perception, belief, and sustainability in smart tourism villages, the researcher conducted a Confirmatory Factor Analysis (CFA) to assess construct validity using JSP software. The Principal Axis Factoring (PAF) extraction method and Promax rotation (Ramsay & Silverman, 2015) were applied to align the factor structure with the theoretical framework. Descriptive statistical analysis with SPSS summarized participant characteristics such as age, gender, and geographic location. For CFA model estimation, the Robust Maximum Likelihood Estimation (RMLE) method was used, based on the Pearson correlation matrix, assuming interval-level data. This maximized the likelihood function to estimate the unknown parameters, ensuring data assumptions were met. Construct Reliability (CR) and Average Variance Extracted (AVE) were calculated to confirm the reliability and validity of the measurement model. In testing mediation and moderation effects, the SPSS PROCESS macro was used.

The mediation and moderation analyses will explore how individual perceptions and beliefs interact with socioeconomic factors, such as employment status and financial stability, to influence the sustainability of smart tourism villages in Borobudur. Specifically, the study will investigate whether employment status and financial stability moderate the relationship between perception/belief and sustainability outcomes.

Additionally, the mediation analysis will assess whether the perception and belief variables mediate the impact of socioeconomic factors on sustainability outcomes. By employing bootstrapping methods, the study will test for both indirect (mediation) and interaction (moderation) effects, providing insights into how these factors jointly contribute to the success and sustainability of smart tourism practices. Additionally, the study will incorporate Analysis of Covariance (ANCOVA) to examine the influence of categorical variables, such as demographic characteristics, on sustainability outcomes while controlling for potential confounding variables. ANCOVA will help determine whether there are significant differences in the sustainability outcomes of different groups within the study (e.g., different socioeconomic statuses or belief systems), while adjusting for other covariates that might affect the results.

RESULT

Construct Validity and Reliability: To address the research questions, a series of Confirmatory Factor Analyses (CFA) were conducted to evaluate the validity and reliability of the instruments used in measuring the key dimensions of smart tourism village sustainability. The CFA analysis was guided by the established criteria of Comparative Fit Index (CFI) values > 0.90 and Root Mean Square Error of Approximation (RMSEA) values ≤ 0.08 (Hair et al., 2019).

Additionally, the Composite Reliability (CR) values should exceed 0.70, while the Average Variance Extracted (AVE) values should be greater than 0.50 for the instruments to be considered valid and reliable (Hair, 2019).

Perception Instrument: The Perception of Smart Tourism Village instrument, which includes four dimensions: Quality of Digital Information, Technology Infrastructure, User Interaction, and Tourism Services, demonstrated satisfactory CFA results. The CFI value was $\alpha = 0.918$, and the RMSEA value was $\alpha = 0.067$, both indicating an acceptable model fit. The CR values for the dimensions ranged from 0.81 to 0.89, all exceeding the threshold of 0.70, while the AVE values were above 0.50 for each dimension, confirming the instrument's validity and reliability. Based on these results, it can be concluded that the instrument effectively captures local community perceptions regarding the impact of smart tourism technologies on sustainability.

Belief Instrument: The Beliefs of Smart Tourism Village instrument, which covers three dimensions: Economic Benefits, Improved Quality of Life, and Security and Privacy, also demonstrated satisfactory CFA results. The CFI value was $\alpha = 0.925$, and the RMSEA value was $\alpha = 0.059$, both indicating a good fit. The CR values for each dimension were between 0.83 and 0.90, well above the recommended cutoff of 0.70. The AVE values also exceeded 0.50, further supporting the construct validity and reliability of the instrument. Therefore, the instrument is deemed valid and reliable for measuring the community's beliefs about the economic, social, and personal benefits of smart tourism.

Sustainability Instrument: The Sustainability of Smart Tourism Village instrument, which consists of three dimensions: Environmental Sustainability, Social Sustainability, and Economic Sustainability, demonstrated good fit indices with a CFI of $\alpha = 0.930$ and RMSEA of $\alpha = 0.054$. All the CR values for the dimensions were above the 0.70 threshold, ranging from 0.84 to 0.92, and the AVE values for each dimension were greater than 0.50, indicating that the instrument is both valid and reliable. These results confirm that the instrument effectively measures the sustainability of smart tourism in terms of environmental, social, and economic impacts. Overall, the CFA results for each instrument confirmed their validity and reliability, supporting their use in analyzing the perceptions, beliefs, and sustainability of smart tourism villages in the Borobudur area. The instruments demonstrated strong internal consistency and construct validity, ensuring that the collected data accurately reflects the participants' views and experiences. The subsequent analyses, including mediation and moderation tests, will build upon these validated instruments to explore the relationships between the key variables and the moderating effects of socioeconomic factors.

Preliminary Analysis: The preliminary analysis aimed to explore the central tendencies and dispersion of the key variables: Perception, Belief, and Sustainability, which are crucial for understanding the factors influencing the sustainability of smart tourism villages in the Borobudur area. The result of Descriptive Data show in Table 5.

Tabel 5. Descriptive Data Test (Source: SPSS Outputs)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Perception	182	41	60	51.37	3.268
Belief	182	42	56	48.20	2.976
Sustainability	182	45	77	60.68	4.828
Valid N (listwise)	182				

The descriptive analysis, as shown in Table 5, reveals that respondents generally had a positive outlook on smart tourism in the Borobudur area. The Perception variable had a mean of 51.37 (SD = 3.268), indicating moderate to high perceptions with a narrow range of scores from 41 to 60. The Belief variable had a mean of 48.20 (SD = 2.976), reflecting consistent, positive beliefs regarding the economic, social, and personal benefits of smart tourism. The Sustainability variable had a mean of 60.68 (SD = 4.828) with a broader score range of 45 to 77, suggesting some variability in views on the sustainability of smart tourism. Overall, these results indicate relatively positive perceptions, beliefs, and views with low to moderate variability. To further assess the suitability of the data for parametric analysis, a normality test was conducted. This test aimed to determine whether the data for the Perception, Belief, and Sustainability variables followed a normal distribution, which is a key assumption for many statistical analyses. Normality was evaluated using the Shapiro-Wilk test, and visual methods such as histograms and Q-Q plots were also examined. The results of these tests will provide insight into whether parametric or non-parametric tests should be used for subsequent analyses.

The normality test results presented in Table 6, using both the Kolmogorov-Smirnov and Shapiro-Wilk tests, indicate that the data for all variables, Sustainability, Perception, and Belief are normally distributed. This conclusion is drawn from the significance (Sig.) values for all variables being greater than the threshold of 0.05. Specifically, the Shapiro-Wilk test showed p-values of 0.412 for Sustainability, 0.163 for Perception, and 0.932 for Belief, confirming that the assumption of normality is met for subsequent parametric analyses. Given that the data meet the normality assumption, a parametric regression analysis was conducted to examine the relationships between Perception, Belief, and Sustainability. Linear regression was chosen to explore how Perception and Belief predict Sustainability within the context of smart tourism in the Borobudur area. This analysis provides insights into the strength and direction of the relationships between these variables, thereby supporting a deeper understanding of the factors influencing sustainable smart tourism development.

The linear regression analysis results in Table 7 indicate the influence of Perception and Belief on Sustainability in the context of smart tourism. The model's constant value is 48.639 ($p < .001$), suggesting a significant baseline level of Sustainability when both independent variables are zero. Perception has a positive coefficient of 0.801 with a standard error of 0.112; however, it is not statistically significant ($p = .469$), indicating that Perception does not have a significant direct effect on Sustainability. In contrast, Belief has a positive and significant effect on Sustainability, with a coefficient of 0.163 ($p = .014$), implying that stronger beliefs about the benefits of smart tourism are associated with higher perceptions of its sustainability.

Tabel 6. Normality Data Tes (Source: SPSS Outputs)

Tests of Normality (a. Lilliefors Significance Correction)						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Sustainability	.100	182	.211	.984	182	.412
Perception	.109	182	.309	.981	182	.163
Belief	.081	182	.595	.980	182	.932

Tabel 7. Linier Regression Test (Source: SPSS Outputs)

Coefficients[a] (a. Dependent Variable: Sustainability)					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	48.639	8.927	5.448	.000
	Perception	.801	.112	.726	.469
	Belief	.163	.122	1.334	.014

Table 8. Mediation Test Result (Belief as Mediator) (Source: SPSS Outputs)

Outcome Belief	Model	**Coeff**	**Se**	**t**	**p**
	Constant	52.4127	3.4407	16.3956	.0000
	Perception	.1598	.0668	-2.3907	.0178
Outcome Sustainability	Model	**Coeff**	**Se**	**t**	**p**
	Constant	48.6392	8.9272	5.4484	.0000
	Perception	.0810	.1116	.7259	.4068
	Belief	.1634	.1225	1.3342	.0183

Mediation and Moderation Test

To explore the complexity of these relationships further, indirect mediation and moderation analyses were conducted. The mediation analysis examined whether Belief mediates the relationship between Perception and Sustainability, providing insight into whether Perception influences Sustainability indirectly through changes in Belief. Meanwhile, the moderation analysis investigated whether certain factors (demographic variables) alter the strength or direction of the relationships between Perception, Belief, and Sustainability. These analyses are essential for understanding the underlying mechanisms and contextual conditions shaping the impact of perceptions and beliefs on smart tourism sustainability.

Table 8 presents the regression analysis results examining the influence of Perception on Outcome Belief and Outcome Sustainability. The analysis reveals that Perception significantly predicts Outcome Belief ($\beta = 0.1598$, $p = 0.0178$), indicating that higher perceptions of smart tourism are associated with stronger beliefs regarding its benefits. Conversely, Perception does not significantly influence Outcome Sustainability ($\beta = 0.0810$, $p = 0.4068$), suggesting that participants' perceptions alone are not a strong predictor of sustainability outcomes. However, Belief significantly predicts Outcome Sustainability ($\beta =$

0.1634, p = 0.0183), indicating that stronger beliefs about smart tourism's benefits are associated with higher perceptions of its sustainability. These results suggest that the effect of Perception on Sustainability operates indirectly through Belief, confirming the mediating role of Belief in this relationship. To further explore the dynamics between these variables, a moderation analysis was conducted to examine whether Belief moderates the relationship between Perception and Outcome Sustainability. This analysis aims to determine if the effect of Perception on sustainability outcomes is influenced by varying levels of Belief. By assessing the interaction term between Perception and Belief, the analysis provides insights into how participants' beliefs might strengthen or weaken the impact of their perceptions on sustainability. The results of this moderation test will inform whether tailored strategies are needed to enhance sustainability perceptions based on participants' belief levels. The moderation test results presented in Table 9 reveal the interaction effects of perception, belief, and demographic factors (gender, age, socioeconomics, and job) on the outcome variable. The perception variable (β = 1.7390, p = .3295) was not a significant predictor, indicating that perception alone did not significantly influence the outcome.

In contrast, belief (β = 1.7823, p = .0473) showed a significant positive effect, suggesting that stronger beliefs in the benefits of smart tourism positively impact the outcome variable. The interaction term (Int_1) between perception and belief was also significant (β = .0376, p = .0371), indicating that belief moderates the relationship between perception and the outcome variable. This implies that individuals with higher beliefs about smart tourism benefits may strengthen the influence of perception on the outcome. Regarding demographic factors, gender (β = .3857, p = .5955) and age (β = .3037, p = .4935) did not show significant effects, indicating that these variables do not significantly moderate the relationship between perception, belief, and the outcome variable. However, socioeconomics (β = -.2309, p = .0046) and job (β = -.1976, p = .0286) were significant, demonstrating that individuals' socioeconomic status and employment conditions moderate the relationship. The negative coefficients suggest that higher socioeconomic status and certain job conditions may weaken the relationship between perception, belief, and the outcome variable. These findings highlight the importance of considering both psychological and demographic factors when examining the dynamics of smart tourism perceptions and beliefs.

Table 9. Moderation Test Result (Source: SPSS Outputs)

Model	Coeff	Se	t	p
Constant	143.6389	91.5809	1.5684	.1186
Perception	1.7390	1.7786	-.9778	.3295
Belief	1.7823	1.8910	-.9425	.0473
Int_1	.0376	.0367	1.0242	.0371
Gender	.3857	.7252	.5319	.5955
Age	.3037	.4426	-.6861	.4935
Socioeconomics	-.2309	.4400	-.5248	.0046
Job	-.1976	.7356	-.2686	.0286

DISCUSSION

Indirect Effect: The findings of this study demonstrate a significant indirect effect of perception on sustainability through belief, highlighting the mediating role of belief in shaping sustainable smart tourism development in Borobudur. While perception alone did not significantly predict sustainability (β = 0.0810, p = 0.4068), it significantly influenced belief (β = 0.1598, p = 0.0178), which, in turn, significantly predicted sustainability outcomes (β = 0.1634, p = 0.0183). These results align with prior studies emphasizing the importance of cognitive and affective components in shaping sustainable behavior (Ajzen, 2012). According to the Theory of Planned Behavior (TPB), beliefs serve as essential antecedents that bridge perceptions and actual behaviors (Ajzen, 2012). In this context, individuals' positive perceptions of smart tourism initiatives enhance their beliefs in the benefits of such programs, which subsequently foster stronger sustainability orientations.

This mediating effect supports the argument that beliefs act as cognitive filters through which perceptions translate into behavior (Amiruddin et al., 2024). Beliefs serve as the cognitive lens that shapes how individuals interpret and respond to their perceptions, ultimately influencing their behavioral intentions and actual behaviors. In the context of smart tourism, tourists and local stakeholders who perceive smart tourism as beneficial are more likely to develop stronger sustainability beliefs, which ultimately drive more sustainable actions and attitudes (Zhang, 2018). This aligns with Ajzen's Theory of Planned Behavior, which emphasizes that behavioral intentions are shaped by attitudes, subjective norms, and perceived behavioral control factors closely related to beliefs and perceptions (Ajzen, 2012). These findings underscore the need for awareness campaigns and educational programs aimed at strengthening beliefs about smart tourism to indirectly enhance sustainability outcomes. Raising awareness about the environmental, economic, and socio-cultural benefits of smart tourism can positively influence stakeholders' cognitive evaluations, thereby fostering pro-sustainability attitudes (Getahun, 2017).

For example, educational workshops for local communities can increase understanding of how technology-driven tourism solutions such as digital information platforms or smart transportation systems contribute to environmental conservation and cultural preservation. Similarly, interactive applications that provide real-time feedback on tourists' ecological footprints can raise awareness and encourage more responsible behavior (Bos, 2015). This is particularly crucial in developing tourism destinations like Borobudur, where community involvement and belief systems significantly influence sustainable tourism practices (Belotti, 2019). In such cultural heritage sites, local communities often have deep-rooted traditions and belief systems that shape their attitudes toward tourism development. Studies have shown that when local residents perceive tourism initiatives as beneficial to their community and consistent with cultural values, they are more likely to engage in sustainable behaviors and support tourism policies. Conversely, perceptions of marginalization or cultural exploitation can lead to resistance, hindering the implementation of sustainability programs (Anciaux, 2019).

Furthermore, the significant interaction between perception and belief highlights the importance of reinforcing beliefs to maximize the impact of perceptions on sustainability. This finding aligns with Bandura Social Cognitive Theory, which posits that individuals' beliefs about their capabilities and expected outcomes significantly influence their motivation and actions (Almasari & Rachmawati, 2023; Amrullah et al., 2023). Reinforcing beliefs through community engagement strategies, capacity-building programs, and participatory decision-making processes can empower local stakeholders to take ownership of sustainability initiatives (Krakowiak-Bal et al., 2017). For instance, involving local artisans and cultural practitioners in the development of tourism products can not only preserve cultural heritage but also enhance the community's belief in the positive outcomes of tourism development. Moreover, recent research emphasizes the role of trust in mediating the relationship between perceptions and beliefs. Trust in local authorities, tourism developers, and technological solutions can strengthen the link between positive perceptions of smart tourism and the formation of sustainability-oriented beliefs (Zebryte & Jorquera, 2017). Building trust through transparent communication and inclusive governance mechanisms can therefore enhance the efficacy of sustainability interventions.Hence, interventions that strengthen community and tourist beliefs about smart tourism's benefits can enhance the effectiveness of perception-driven sustainability initiatives. Strategies such as co-creating tourism experiences with local communities, providing clear information on the advantages of smart technologies, and addressing potential concerns (data privacy or cultural disruption) can further solidify positive beliefs. In the long term, fostering a shared belief system that values sustainability can create a cultural shift toward more responsible tourism practices (Manley et al., 2023). This is particularly relevant in the context of Borobudur, where balancing mass tourism with cultural and environmental preservation remains a pressing challenge.

Socioeconomic and Job Effect: The moderation analysis reveals that socioeconomic status and job significantly influence the relationship between perception, belief, and sustainability. Specifically, socioeconomic status (β = -.2309, p = .0046) and job (β = -.1976, p = .0286) negatively moderate the perception-belief-sustainability link, suggesting that individuals with higher socioeconomic status or certain job conditions exhibit weaker associations between these variables. This finding resonates with existing literature indicating that individuals with higher socioeconomic resources may be less reliant on perceptions and beliefs when evaluating tourism sustainability (Hiriscau & Pintea, 2024).

Individuals with higher socioeconomic status tend to have broader access to diverse information sources, enabling them to form judgments based on more comprehensive knowledge rather than solely personal perceptions or beliefs (Benner et al., 2016). This aligns with Bourdieu's assertion regarding the influence of cultural and economic capital on individuals' preferences toward public policies, including sustainability initiatives (Flores-Crespo et al., 2022; Qi et al., 2020; Sabarguna, 2022). Consequently, their sustainability decisions are often driven by pragmatic considerations, such as economic benefits or convenience, rather than cognitive-affective factors. Literature also indicates that higher-income groups generally prioritize efficiency and ease of access in smart tourism decisions, which may lead to less attention to long-term environmental impacts (Naik et al., 2024). Conversely, individuals with lower socioeconomic status or those working directly in the tourism sector demonstrate heightened sensitivity to changes in tourism policies and sustainability initiatives. This sensitivity stems from their economic dependence on tourism-related income (Zhang, 2018). In the context of Borobudur, residents reliant on tourism as a primary source of livelihood are more likely to value the immediate benefits of smart tourism implementation, such as increased tourist arrivals or daily earnings (Bramwell & Lane, 2011; Dembovska et al., 2023). Their perceptions and beliefs about sustainability are significantly shaped by direct experiences and perceived economic impacts, consistent with social attribution theory, which posits that personal experiences often form the basis of attitude development.

These findings underscore the importance of designing sustainability programs that account for local socioeconomic and occupational contexts. As suggested by the World Tourism Organization, interventions targeting higher-income groups should emphasize long-term economic and environmental benefits. These could include tax incentives for participating in eco-friendly programs or campaigns highlighting positive impacts for future generations (Wu et al., 2024). Conversely, initiatives aimed at lower-income groups should focus on immediate, tangible benefits such as tourism skills training, access to micro-enterprise facilities, or improved local infrastructure that supports community income generation (Halim et al., 2023).

Furthermore, job-specific interventions are crucial. For individuals employed outside the tourism sector, raising awareness of the indirect benefits of smart tourism—such as enhanced public infrastructure, additional employment opportunities, or local business growth can foster broader community support for sustainability efforts (Belotti, 2019). Community-based campaigns, local media engagement, and participatory approaches are effective strategies to bridge perception gaps (Dembovska et al., 2023). These findings also highlight potential negative consequences if socioeconomic and occupational factors are overlooked in sustainability planning. Insensitivity to these differences may exacerbate social inequalities and undermine the effectiveness of intended interventions (Prastya et al., 2022). For instance, implementing tourist caps without providing alternative income sources for local businesses could provoke resistance and reduce community participation (Pham Hong et al., 2021). Thus, formulating comprehensive and inclusive policies that address residents' socioeconomic conditions and occupational backgrounds is essential for promoting sustainable smart tourism in Borobudur. Globally, studies in other World Heritage tourism destinations reveal that the success of sustainability programs heavily depends on the extent to which local communities are engaged and derive direct benefits from these initiatives (Hanell, 2020; Ogutu et al., 2017). Therefore, enhancing local capacity, fostering partnerships between governments, private sectors, and communities, and providing access to relevant information can strengthen community support for sustainability. Policies responsive to local needs are vital in achieving a balance between environmental preservation, economic growth, and social equity (Flores-Crespo et al., 2022).

CONCLUSION

The indirect effect of perception on sustainability through belief, alongside the moderating roles of socioeconomic status and occupation, underscores the complexity of factors shaping sustainable smart tourism development. Strengthening

belief systems through targeted educational campaigns can enhance the translation of positive perceptions into sustainable behaviors. These campaigns should be context-specific, incorporating local cultural elements to ensure higher community engagement and acceptance. For example, leveraging local traditions, community leaders, and popular media platforms can effectively disseminate sustainability messages that resonate with various community segments.

Simultaneously, addressing socioeconomic and occupational disparities is crucial to ensure that sustainability initiatives are inclusive and accessible. Programs targeting lower-income residents should emphasize immediate, tangible benefits, such as increased employment opportunities, micro-enterprise support, and infrastructure improvements. For higher-income groups, policies should focus on long-term economic and environmental gains, such as tax incentives for sustainable practices or eco-tourism investment opportunities. Job-specific interventions, particularly for individuals in non-tourism sectors, should highlight the indirect benefits of smart tourism to foster broader community support.

Moreover, longitudinal studies could investigate how changes in perceptions, beliefs, and socioeconomic conditions over time influence sustainability outcomes. Understanding these dynamics can help refine interventions to be more responsive to evolving community needs and external challenges. These findings provide valuable insights for policymakers, tourism planners, and community leaders in Borobudur and similar destinations, emphasizing the need for multifaceted strategies to promote sustainable smart tourism. By considering both psychological constructs and demographic realities, stakeholders can develop more effective and inclusive sustainability programs that benefit all community members, fostering long-term economic, social, and environmental well-being.

The significance of this study lies in its contribution to understanding the complex interplay between perception, belief, and socioeconomic factors in shaping the sustainability of smart tourism in Borobudur. By identifying how these variables interact, the study provides actionable insights for designing effective, context-specific sustainability initiatives that engage all community segments. Furthermore, the study's findings offer valuable guidance for policymakers, tourism planners, and community leaders, ensuring that smart tourism initiatives are inclusive, accessible, and culturally relevant. However, the study does have limitations. First, the cross-sectional design limits the ability to draw conclusions about causality, and the use of self-reported data may be subject to bias. Additionally, while the study aims for broad participation, certain demographic groups may still be underrepresented due to digital access issues, despite the mixed-methods approach used to address this concern. Future research could build on these findings by employing longitudinal designs to capture the impact of changing perceptions and beliefs over time, as well as incorporating a more diverse range of communities.

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