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Application of Spatial Augmented Reality for Sustainable Tourism Management: A Case Study of Nature-based Tourism in Japan

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Abstract

The purposes of this research are 1) to identify the factors that influence the adoption of Spatial Augmented Reality (SAR) in Nature-based Tourism (NBT) and 2) to investigate the relationship between SAR and sustainable tourism management (STM) in Japan. The study involved 402 participants, selected using convenience and purposeful sampling methods, who completed an online questionnaire distributed via email and social media with a coefficient of 0.92. The conceptual model used in this study included independent variables such as Technological Context (TC), Organizational Context (OC), Environmental Context (EC), SAR adopted in NBT products (ARNBT), and STM. Data was analyzed using Structural Equation Modeling (SEM) analysis, including Confirmatory Factors Analysis (CFA).

The results showed that EC had a significant effect (ß=0.737, p<0.001) on ARNBT, while TC (ß=0.206) and OC (ß=0.003) were insignificant factors affecting the adoption of SAR in NBT products in Japan. ARNBT, on the other hand, had a significant effect on STM (ß=0.936, p<0.001), particularly in the social (ß=0.96), economic (ß=0.99), and environmental (ß=0.86) aspects. Finally, the research developed the new model (χ2= 853.074, χ2/df= 1.737, GFI=.899, CFI=.962, TLI=.949, AGFI=.855, RMSEA=.043) with EC, ARNBT, and STM.

Finally, the research suggests that environmental factors can be competitive and government pressure, which can positively influence the adoption of SAR in NBT products in the case of Japan. Moreover, from a management perspective, the economic aspect is the most important consideration for STM.

Keywords: Sustainable tourism management, Nature-based tourism, Spatial augmented reality

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Introduction

In 2020, the Japanese government announced the policy to promote NBT initiatives by utilizing digital technology to improve the quality of tourism resources such as culture, art, and nature for the tourists with high-value-added experience after the COVID-19 situation and regarding STM to obtain the continued growth in tourism and gain future sustainability. Technological innovation toward sustainability is considered an essential component for the growth of the business including tourism industry today (Alsos, Eide, & Madsen, 2014; Evans et al., 2017; Genc, 2020; Hjalager, 2015; Ratten & Braga, 2019; Weiermair, 2006) and the need for innovation to get a competitive advantage is highly expected (Hansen et al., 2019). Recently, Spatial Augmented Reality (SAR) is getting more attention as one of the innovational technologies to enhance tourists' experience. SAR is a form of Augmented Reality (AR) technology that blends virtual content with the real-world environment, often referred to as mixed reality. In the context of tourism, SAR has been utilized in various ways to enhance visitor experiences and engagement with existing resources such as museums, deteriorated heritages, events, attractions in theme parks, and natural resources (Bec et al., 2021; Bec et al., 2019; Mine, Van Baar, Grundhofer, Rose, & Yang, 2012). SAR combined with nature-based activities, such as night walks in natural environments, offers unique opportunities for NBT experiences due to its trend (Sand & Gross, 2019). However, despite its complementary relationship between innovative technology, NBT, and sustainability, the relationship is still largely lacking in the research alongside rapid growth in need (Ratten & Braga, 2019).

Therefore, this research aims to reveal and find out what factors affect digital technology, SAR on natural resources in the context of NBT products, and the relationship between SAR adoption and STM in the case of Japan by using quantitative method research.

Purposes of the Study

1. To identify the factors affecting to adoption of SAR in NBT in Japan.
2. To investigate the relationship between SAR and STM in NBT in Japan.

Literature Review

Technology-Organization-Environment Theory

Technology-Organization-Environment (T-O-E) theory is one of the innovation theories that is common to identify the factors that affect the adoption of new technology to the services or products at an organizational level established by Tornatzky and Fleischer (1990, as cited in Oliveira & Martins, 2011). Currently, SAR adoption has been studied using individual adoption theory in the context of tourism (Loureiro, Guerreiro, & Ali, 2020). However, in the cases of SAR and NBT, SAR technology was adopted at the organizational level. Therefore, this study employs the T-O-E theory framework to address technology adoption at an organizational level. This study uses the common factors in the theory built by the context of NBT. However, some adoption

factors were adjusted in different T-O-E contexts since T-O-E is a framework and not strictly theorized. (Cruz-Jesus et al., 2019) Thus, this study intends to construct an adoption model adjusted by the specific context associated with NBT products and SAR, offering industry-specific and technology-specific insights to reveal the relationship with each dimension of STM.

Technological Context

Technological context (TC) refers to the "Systems design perspective" (Tornatzky & Klein, 1982). The technological factors considered significant in this study are relative advantage and compatibility. Relative advantage, in the context of NBT, refers to enhancement in visitor experience and reducing danger of the activity as innovation and adopting the technology is expected to impact these factors positively (Hansen et al., 2019). Compatibility is measuring innovation to be consistent with the existing values (Tornatzky & Klein, 1982). The integration with the existing value of a product can follow the characteristics of NBT products, such as natural resources, culture, and activity (ATTA, 2018). Compatibility positively impacts general studies in adopting technological innovation by the organization (Chiu et al., 2017).

Hypothesis 1: Technological context affects the adoption of SAR in NBT.

Organizational Context

Organizational context describes a characteristic of the organization and internal factors that impact on the adaptation of the technology. Ratten & Braga (2019) addressed that the decision to innovate depends on the firm size and the knowledge of top management executives, and their attitude towards innovation also positively impacts the adaptation of the new technology in the tourism organization. The competency of the organization towards the new technology is also observed as a positive effect (Lin, 2014). Higher knowledge of employees about the technology and more adaptation of the technological innovation resulted (Hansen et al., 2019; Ratten & Braga, 2019; Tornatzky & Klein, 1982).

Hypothesis 2: Organizational context affects the adoption of SAR in NBT.

Environmental Context

Environmental context is the external factors that can affect the adoption of the innovation (Angeles, 2013). Tourism innovation aims at gaining a competitive advantage and the trend in NBT, which stimulates the implementation of the innovation on the product as the external factor. (Hansen et al., 2019) Therefore, competitive pressure is assumed to be an essential factor. In addition, since the expectation of sustainable tourism management was announced by the Japanese government, the pressure for sustainable management by the government also exists as an external influence.

Hypothesis 3: Environmental context affects the adoption of SAR in NBT.

Adoption of SAR in NBT product

Safety management and visitors' experience are counted as the primary factors in designing and installing the technologies that can be innovative in NBT (Hansen et al., 2019). Moreover, it is expected the preservation of the natural resources by its profit. In addition, the product can also have a significant impact on the local economy. Themed Entertainment Association (TEA) noted that there was an 80% increase in tourism to the park where the SAR was implemented, a 200% increase in business for local restaurants, and a 100% increase for local hotels in the case of SAR adopted NBT product in Canada in 2016. Because of these aspects, visitor experience, safety, nature preservation, and profitability are observed variables for the adoption of SAR in NBT products.

Sustainable Tourism Management

Sustainable tourism management (STM) is a vital aspect of the tourism industry to the future development. STM contains three dimensions such as social, economic, and environmental and all of them need to be equally managed (UNWTO, 2012). Bec et al. (2021) noted that SAR is an innovative digital technology and can be expected in the outcome of STM with a high-level visitor experience. However, in many previous researches, the relationship of technological innovation and sustainable management is only addressed in broad sense of the terms without numerical data (Hansen et al., 2019; Ratten and Braga, 2019; Rodríguez et al., 2014; Ali and Andrew, 2014; Moscardo, 2008; Polat, 2015; Dibra, 2015; Genc, 2020; Pröbstl & Haider, 2013). In addition to it, although it is insisted that there are conceptual links in NBT and STM (Knowles, 2019), NBT -is not innately sustainable (Hunt & Harbor, 2019). Since the natural resource is essentially related to NBT, it is often addressed in environmental protection issues. Therefore, this study investigates the relationship between SAR adopted in NBT product and STM with numerical data.

Hypothesis 4: Adoption of SAR in NBT affects sustainable tourism management.

Conceptual Framework

The T-O-E framework was employed to know what factors affect the adoption of SAR in the NBT context. Additionally, this study aims to see the relationship between technological innovation in NBT products and STM in the case of SAR in Japan. Thus, the conceptual framework of this research was designed in Figure 1.

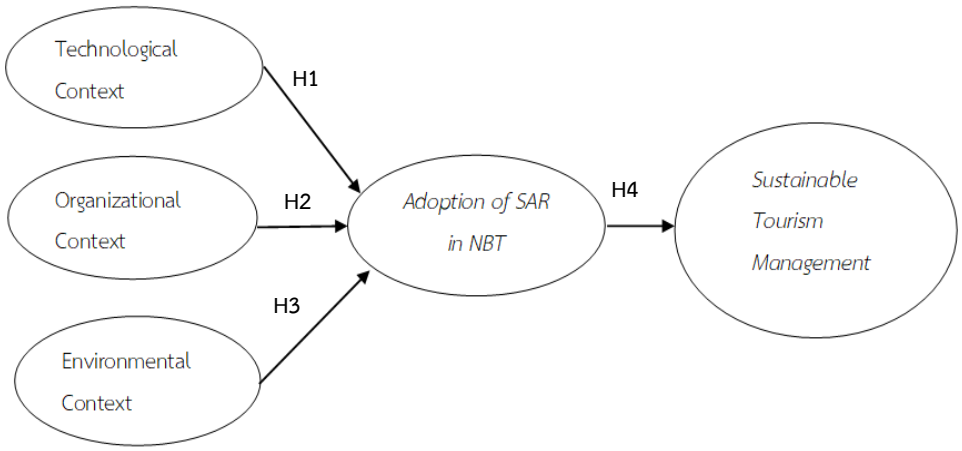

Figure 1 Conceptual framework

Methodology

The quantitative method is used in this research to obtain concrete evidence with numerical data. While the qualitative research method has been recognized as the appropriate method for NBT and significant in describing leisure activities (Clinch & Filimonau, 2017; Løseth, 2017), this research aims at gaining more significant evidence than recent studies with quantitative data in the specific context.

This research aims to find the factors affecting digital technology, such as SAR, onto NBT products and the relationship with STM to contribute to the government requirement of management perspective in STM (Ministry of Land, 2019). Therefore, the target population for this research is the stakeholders that have rich knowledge of SAR technology, tourism management, and nature-based products in Japan, such as long-term employees, CEOs, managers, organizers, and governors. To select the respondents of this study, the combination of convenience sampling and purposeful sampling is employed to the stakeholders that have rich knowledge of SAR, tourism management, and nature-based products in Japan e.g., long-term employees, CEOs, managers, organizers, and governors.

The quantitative data was collected through the questionnaire designed by the researcher referred to previous T-O-C theory and sustainable tourism management researches and distributed through online tools such as Google Forms translated into both Japanese and English. The questionnaire was divided into three parts, namely Part 1 and 2 added 2 more parts in Part 2 namely Part 2-1, 2-2. Part 1 consists of general information such as position, SAR experience, and willingness to use SAR in the future. The questions were translated into Japanese by the researcher and built by Five-point Likert Scale with a range of 5 “Strongly agree” to 1 “Strongly disagree.” (See item in Appendix 1)

For the sample size, since the population is undefined, commonly, more than 200 is needed (Boomsma, 1987). Therefore, this research employs Cochran (1963:75) formula which is

common to use for the undenied population and the sample size resulted as 384. To avoid the errors, increased sample size to 402 was employed in this research.

The result of the pilot test with 30 respondents showed that the total Cronbach's alpha of construct was .92, which is required to be in the range of 0.8 to 1.00 to be excellent reliability (Pallant, 2020). Also, each variable contained acceptable reliability with the range of .68 to 84., the questionnaire is valid for collecting data.

Statistics Used in Data Analysis

The collected quantitative data was examined in a statistical program called AMOS. The survey data was analyzed by three different methods descriptive analysis, confirmatory factor analysis, and Structural Equation Modelling (SEM).

In descriptive analysis, the researcher generated a demographic profile with mean, frequency, standard deviation, and the percentage of the respondents. The demographic data in this study includes respondents' position in the organization and experience and intention of the usage of SAR in NBT products. The researcher also examined the correlation of the following factors TC (Technological context), OC (Organizational context), EC (Environmental context), ARNBT (Adoption of SAR in NBT), and STM (Sustainable Tourism Management). After confirmatory factor analysis, SEM was employed to analyze the primary purpose of this study. SEM enables to examine theoretical model with the empirical data by checking whether it fits with the goodness of fit criteria or not. According to Hair (2018), a more complex model with larger samples should be less strict than a simpler model with smaller samples. Commonly used goodness of fit criteria is based on covariance matrix comparisons of data observed with the estimated covariance matrix, with several measures such as Chi-square, Goodness of Fit Index (GFI), Comparative Fit Index (CFI) or Tucker Lewis Index (TLI), Adjusted Goodness of Fit (AGFI), and Root Mean Square Error of Approximation (RMSEA).

Table 1 Model of Goodness of Fit

The goodness of fit test	Good fit or accepted levels	Sources
Chi-square ($\chi 2$)	Significant p-values expected (p>.05)	Hair (2018)
Goodness-of-fit index (GFI)	0 to 1 (greater than .90 is good)	Hair (2018)
CFI	Above .90	Hair (2018)
TLI	Above .90	Hair (2018)
AGFI	Above .80	Hair (2018)
RMSEA	<.05	Doll, Xia, & Torkzadeh (1994)

Results

The positions of participants resulted as Employee (39.3%) has the highest ratio in this section, followed by Manager (16.92%), CEO (13.93%), Organizer (12.94%), Governor (11.94%), and Other (4.98%). 67.7% of participants had experience using SAR on NBT products while most of them have positive intentions to adopt SAR in the future (Table2).

Table 2 The frequency and percentage of general Information (n=402)

Question		Frequency	Percentage
1. Position	CEO	56	13.93
	Manager	68	16.92
	Organizer	52	12.94
	Governor	48	11.94
	Employee	158	39.30
	Other	20	4.98
2. SAR experience	Yes	272	67.66
	No	130	32.34
3. Intention to use SAR in the future	Yes	325	80.85
	No	77	19.15
Total Participants		402	100

After the descriptive analysis and confirmatory factor analysis (see Appendices), each observed indicators of each latent construct were modified for SEM as Table 3. Finally, there were 5 latent variables including 54 indicators to test SEM. To meet the model fit criteria, the correlations between errors were adjusted according to modification indices provided by AMOS. After the modification, all criteria index reached the standard of the model fit criteria as $\chi 2$= 1506.37, $\chi 2$/df= 1.34, GFI=.880, CFI=.976, TLI=.968, AGFI=.830, RMSEA=.029.

Table 3 Summary of confirmatory factor anal

		TC	OC	EC	ARNBT	STM
Number of observed variables		2	3	2	4	3
Number of indicators in total		7	9	6	17	15
Indices	**Criterions**	**Results**				
$\chi 2$	p>0.05	48.793	35.014	19.591	146.578	136.466
$\chi 2$/df	<3	1.877	1.667	1.3	1.809	1.869
GFI	≥0.8	.976	.980	.988	.956	.961
CFI	≥0.9	.988	.996	.997	.981	.979
TLI	≥0.9	.979	.992	.994	.972	.966
AGFI	≥0.8	.949	.958	.970	.927	.927
RMSEA	≤0.05	.047	.041	.028	.045	.047

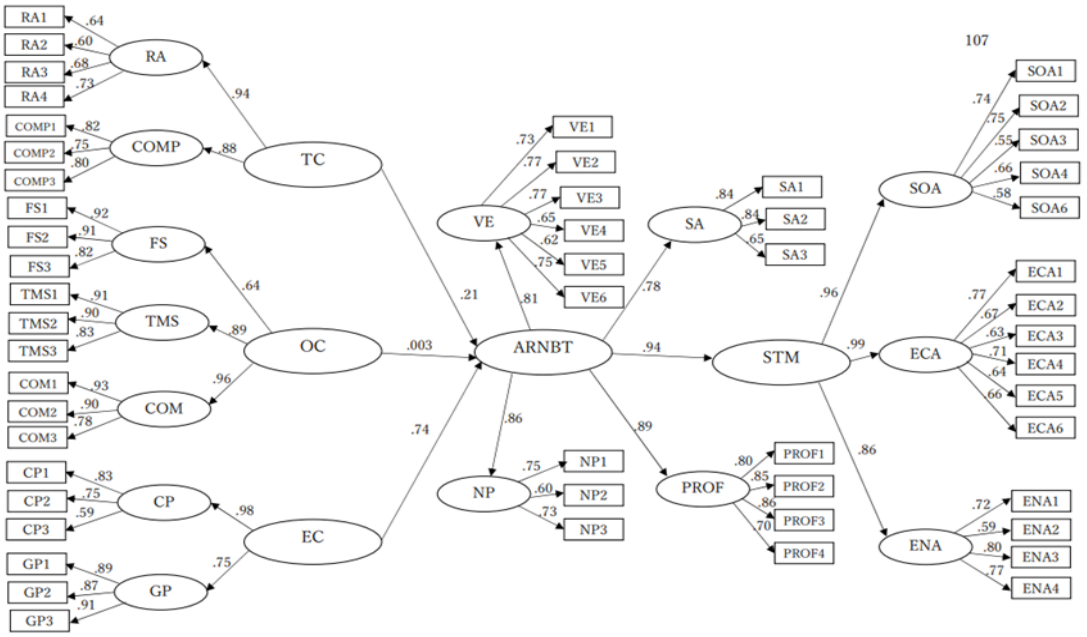

Figure 2 Structural Equation Model testing

Table 4 Hypothesis summary

Hypothesis	Path	Loading	S.E.	T (C.R)	Decision
H1	ARNBT⟵TC	.206	.095	.026	Rejected
H2	ARNBT⟵OC	.003	.107	.983	Rejected
H3	ARNBT⟵EC	.737	.126	3.311***	Supported
H4	ARNBT⟶STM	.936	.101	11.545***	Supported

***p<.001

In this study, there were 4 hypotheses proposed based on the literature review to reveal the effect of the case of SAR adoption in NBT on sustainable tourism management (Table 4).

Hypothesis one represented the effect of technological context on the adoption of SAR in NBT. As a result, technological context (TC) to the adoption of SAR in NBT (ARNBT) marked .206 with a p-value of .026 which is p<.05. Thus, technological context with descriptive variables; relative advantage (RA) and compatibility (COMP) are not significant to adoption of SAR in NBT and hypothesis one is rejected.

Hypothesis two represented the effect of organizational context on the adoption of SAR in NBT. As a result, organizational context (OC) to the adoption of SAR in NBT(ARNBT) marked .003 with an exceeded acceptable p-value of .983. Thus, organizational context included descriptive variables namely, firm size (FS), top management support (TMS), and competence (COM) are not significant to the adoption of SAR in NBT, and hypothesis two is rejected.

Hypothesis three represented the effect of environmental context on the adoption of SAR in NBT. As a result, environmental context (EC) to the adoption of SAR in NBT(ARNBT) marked

relatively high as .737 with an acceptable p-value, p<.001. Thus, environmental context included descriptive variables namely, competitive pressure (CP), government pressure (GP), and external support (ES) are significant to the adoption of SAR in NBT, and hypothesis three is supported.

Hypothesis four represented the effect of the adoption of SAR in NBT onto STM. As a result, the adoption of SAR in NBT(ARNBT) to STM was marked as .936 with an acceptable p-value<.001. Thus, the adoption of SAR in NBT included descriptive variables namely, visitor's experience (VE), safety (SA), nature preservation (NP), and profitability (PROF), which is significant to STM with each social aspect (SOA), economic aspect (ECA), and environmental aspect (ENA) and hypothesis four is supported.

Based on the hypothesis testing, the new model was assumed by the researcher with all criteria index reached the standard of the model fit criteria as following $\chi 2$ = 853.074, $\chi 2$/df= 1.737, GFI=.899, CFI=.962, TLI=.949, AGFI=.855, RMSEA=.043.

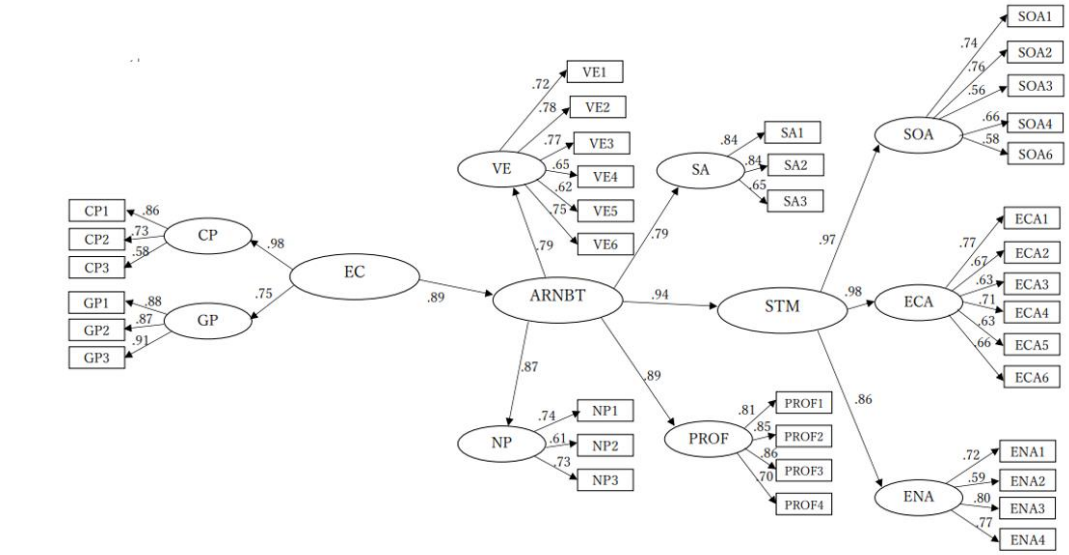

Figure 3 Structural Equation Model testing for a new model

Table 5 The standardized factor loading for paths between latent variables in a new model

Path	Result			
	β	SE	T (CR)	R^2
ARNBT⟵EC	.891	.042	11.322***	.794
ARNBT⟶STM	.942	.106	11.420***	.888

***p<.001

Table 5 shows the loading score for each path in the new model. EC to ARNBT was .89 and ARNBT to STM was .94 at a significant level of p<.001.

Discussion

As SAR experience, 272 respondents answered “Yes” which was 67.66% and 130 respondents answered “No” with a rate of 32.34%. This result indicates that more than half of the respondents have experience using SAR on NBT products in Japan. For the future intention to use SAR, 80.85% of respondents answered “Yes” and 19.15% answered “No.” In high ratios, many organizations were willing to adopt SAR into their products.

Technology-Organization-Environment (T-O-E) theory is common to identify the factors that affect the adoption of new technology to the services or products at the organization level established by Tornatzky & Fleischer (1990, as cited in Oliveira & Martins, 2011), however, some adoption factors can be adjusted in different T-O-E context since T-O-E is a framework and not strictly theorized. (Cruz-Jesus et al., 2019) Since the T-O-E theory is not addressed in SAR technology within the tourism industry yet, this study used the common factors in the theory built by the context of NBT in the case of Japan. As a result, TC and OC showed a minimum effect on ARNBT, which were .21 and .003, respectively with an insignificant p-value of more than .01. Without sufficient technological knowledge, stakeholders may have a limited understanding of the capabilities and potential benefits of SAR. This lack of understanding can result in a lower perception of SAR's technological advantages and employees’ compatibility, reducing its perceived value in the adoption decision-making process. Li & Chen (2023) noted that with the rapid advancement in digital technology, employees need to stay updated on new technologies and the education ensures that employees can adapt to technological changes efficiently. In addition to it, OC involves factors such as firm size, top management support, and competence. If these factors are not adequately aligned or prioritized within the organization, it may result in insufficient resources allocated towards SAR adoption initiatives. Without sufficient resources, including budget, manpower, and managerial support, the adoption of SAR may face obstacles or delays. Choi (2023) addressed that in profit-driven organizations, resources are often allocated based on their potential to generate revenue or improve profitability. If SAR adoption initiatives do not align directly with the company's profitability goals, they may receive limited resources and support from top management. As a result, factors within the OC, such as firm size and top management support, may have less influence on SAR adoption decisions.

In contrast, EC had the highest loading score of 1.23 with $p<0.001$. EC was significant with the indicators such as competitive pressure and government pressure. EC had a competitive advantage as the highest score (.98) and its effect on the adoption was .89. As the COVID-19 pandemic situation boosted the additional outbreak on tourists’ demand for NBT (Fredman & Margaryan, 2020), considering this trend increased competitive pressure. Moreover, in 2020, the Japanese government announced the policy to promote NBT initiatives by utilizing digital technology to improve the quality of tourism resources such as culture, art, and nature for the tourists with high-value-added experience after the COVID-19 situation and regarding STM to obtain the continued growth in tourism and gain future sustainability. These announcements may

have affected the high loading score of government pressure and the whole external context loading score result.

Profitability was the highest loading score (.89) in ARNBT followed by nature preservation (.87). Profitability becomes a focus when financial aid is required to support nature-based activities. By prioritizing profitability, the aim is to generate sufficient revenue to cover operational costs, repay loans, and potentially invest in the development and maintenance of natural infrastructure (Kuramoto & Ide, 2023). According to Themed Entertainment Association (2016), Lumina case as adoption of SAR in NBT was appraised the adaptation of modern technologies to a living environment aiming at giving to the visitor a unique experience as well as preservation of the natural resources with a significant impact on local businesses and the result of the study showed the most impact on profitability followed by nature preservation. Visitors' experience and safety were also highly related to the adoption. In addition to it, this study also showed its significant effect on economical aspect as the most in STM. The relationship of technological innovation and sustainable tourism management has been insisted in many previous researches (Hansen et al., 2019; Ratten & Braga, 2019; Rodríguez et al., 2014; Ali & Andrew, 2014; Moscardo, 2008; Polat, 2015; Dibra, 2015; Genc, 2020; Pröbstl & Haider, 2013), and the relationship may be proven that with empirical data in this study.

Additionally, a new model after hypothesis testing also reached the standard of the model fit criteria as following $\chi 2$ = 853.074, $\chi 2$/df= 1.737, GFI=.899, CFI=.962, TLI=.949, AGFI=.855, RMSEA=.043.

Conclusion

The objectives of this study were 1) to identify the factors affecting the adoption of SAR in NBT in Japan. 2) to investigate the relationship between SAR adopted in NBT and STM in Japan. As a hypothesis testing result shows, technological context and organizational context were not significant factors affecting to adoption of SAR in NBT in Japan. In contrast, Environmental context was significant with P<.001.

Relative advantage and compatibility as technological context have insignificant effects on the adoption of SAR in NBT as well as organizational context with firm size, top management support, and competence. Thus, re-consideration is required to construct the framework such as using qualitative data in the future study. However, the environmental context emerged as a significant factor ($p < .001$), indicating that factors like competitive pressure and government regulations play a crucial role in driving SAR adoption in NBT in Japan. Environmental context factors, such as competitive and government pressures, are significant influencers of SAR adoption in NBT. This suggests that when SAR is adopted in NBT, environmental pressures become a key driver, while technological and organizational contexts are not significant factors.

Among STM factors, all of three aspects had positive relationship with ARNBT, especially the economical aspect had the strongest relationship from the management perspective followed

by social aspect and environmental aspect. Profitability emerged as a critical factor affecting SAR adoption, influencing STM across economic, social, and environmental dimensions.

In conclusion, the study provides insights into the adoption of SAR in NBT in Japan, highlighting the importance of environmental context and its impact on sustainability and profitability. These findings could inform decision-making processes for organizations seeking to adopt SAR in their NBT products and contribute to the understanding of sustainable technology management in the tourism industry. The findings emphasized the complex interplay between environmental pressures, economic considerations, and SAR adoption in NBT in Japan. It underscored the importance of considering broader contextual factors and managerial perspectives in understanding the adoption of sustainability practices in business technologies. The study highlighted the need for a re-evaluation of frameworks used to understand SAR adoption, suggesting the incorporation of qualitative data for a more comprehensive understanding.

Limitation and Suggestions for the Future Research

This study provides valuable contributions to both theoretical understanding and practical application in the realm of NBT in Japan, with a focus on technological innovation and STM. The findings have the potential to influence decision-making and strategy formulation within the tourism industry supporting efforts to promote environmentally responsible tourism experiences. The stakeholders in the tourism industry can utilize them to plan for the integration of SAR in NBT products. This involves understanding how to incorporate AR technology effectively to enhance visitor experiences while maintaining environmental sustainability. Additionally, this study contains several limitations and the recommendation for further study is as following:

1. By collecting qualitative data, future research can delve deeper into technological and organizational context indicators related to the adaptation of SAR in NBT. Combining quantitative and qualitative methods allows for a more comprehensive understanding, enriching the academic study of SAR adaptation.

2. Focusing on specific organizations or companies in future research can mitigate misunderstandings or variations in interpretations among respondents. By obtaining data from each organization individually, researchers can ensure clarity and accuracy in understanding organizational perspectives on SAR adaptation in NBT. This approach enhances the reliability and validity of the research findings.

3. Conducting research in other countries beyond Japan enables comparative analysis of SAR adaptation in NBT across different cultural, economic, and environmental contexts. Comparing results from multiple countries allows for a broader understanding of the factors influencing SAR implementation and its effectiveness in promoting sustainable tourism management.

4. Investigating STM from various perspectives, such as visitors' and communities' viewpoints, offers a more holistic understanding. By integrating diverse perspectives, future studies can evaluate the effectiveness of SAR in NBT from different angles, including both managerial and scientific viewpoints. This integrated analysis provides a comprehensive assessment of STM practices and facilitates evidence-based decision-making.

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Appendix 1 Questionnaire Items and Indicators

Indicators		Items
TC	RA1	I believe that SAR helps to enhance visitor's experience.
	RA2	I believe that SAR makes the nature activity safer.
	RA3	I believe that SAR makes more profit.
	RA4	I believe that SAR has benefit on environment preservation such as having less harm on the environment.
	COMP1	I believe that SAR is compatible with my nature existing.
	COMP2	I believe that SAR is compatible with my culture existing.
	COMP3	I believe that SAR is compatible with my activity existing.
OC	FS1	The capital of our organization is high compare to other organizations.
	FS2	The revenue of our organization is high compare to other organizations.
	FS3	The number of employees is high compare to other organizations.
	TMS1	My top management had/has the intension to install SAR in our product.
	TMS2	My top management supports to install SAR in our product.
	TMS3	My top management has a clear vision as the organization and the action which is installing SAR in the product is one of the actions to achieve the vision.
	COM1	The employees in my organization have enough knowledge about SAR.
	COM2	The employees in my organization are capable to implement SAR.
	COM3	How do you think about adopting SAR as the employee in your organization?
EC	CP1	There is a competitive pressure among the tourism industry to adopt SAR as technological innovation for the products.
	CP2	I believe that without SAR, my organization loses the customers.
	CP3	I believe that SAR provides my organization competitive advantage.
	GP1	Government announcement about tourism influenced to install SAR in the product.
	GP2	Government announcement about sustainable management influenced to install SAR in the product.
	GP3	Government policy for tourism influenced my organization to install SAR in the product.
ARNBT	VE1	Visitor's experience in SAR adopted NBT product is higher than the standard NBT products without technological effect.
	VE2	Visitors can enjoy the activity more in SAR adopted NBT product than the standard NBT products without technological effect.
	VE3	Visitors can learn more about culture in SAR adopted NBT product more than the standard NBT products without technological effect.

Indicators		Items
	VE4	Visitors can learn more about history in SAR adopted NBT product more than the standard NBT products without technological effect.
	VE5	Visitors can learn more about environment in SAR adopted NBT product more than the standard NBT products without technological effect.
	VE6	I believe that SAR generates the unquantified value for visitors.
	SA1	It is safer for visitors to participate in SAR adopted NBT activity than the standard NBT activities without technological effect.
	SA2	It is safer for employees to implement SAR adopted NBT activity than the standard NBT products without technological effect.
	SA3	The possibility of accident such as injuries and illness caused during the activity, is low with SAR adopted NBT activity than the standard NBT products without technological effect.
	NP1	Damage in nature is less in SAR adopted NBT product than the standard NBT products without technological effect.
	NP2	SAR adopted NBT product can affect to visitor's perception towards environmental awareness.
	NP3	SAR adopted NBT product can help nature preservation.
	PROF1	Profitability of the SAR adopted NBT product is higher than the standard NBT products without technological effect.
	PROF2	SAR adopted NBT products has more sales than the standard NBT products without technological effect.
	PROF3	Our total revenue increases with SAR adopted NBT product.
	PROF4	I believe SAR adopted NBT product contributes to the branding of my organization.
STM	SOA1	I believe that SAR in NBT product helps to manage social sustainability.
	SOA2	I believe that SAR in NBT product obtains the understanding by the people in the region.
	SOA3	I believe that SAR in NBT product positively affects to the level of community satisfaction.
	SOA4	I believe that SAR in NBT product positively affects to tourism of communities.
	SOA6	I believe that SAR in NBT product positively affects to secure tourists.
	ECA1	I believe that SAR in NBT product is affective to manage economical sustainability.
	ECA2	I believe that SAR in NBT product positively affects to manage tourism seasonality.
	ECA3	I believe that SAR in NBT product helps to prevent tourism profit leakages.
	ECA4	I believe that SAR in NBT product positively affects to employment in the region.

Indicators	Items
ECA5	I believe that SAR in NBT product benefits to the economic in the destination.
ECA6	I believe that SAR in NBT product benefits to the community.
ENA1	I believe that SAR in NBT product is affective to manage environmental sustainability.
ENA2	I believe that SAR in NBT product is affective to protect critical ecosystem.
ENA3	I believe that SAR in NBT product is effective to solid waste management.
ENA4	I believe that SAR in NBT product is affective to control noise level.

RA=Relative Advantage, COMP=Compatibility, FS=Firm Size, TMS= Top Management Service, COM= Competence, CP= Competitive Pressure, GP= Government pressure, ES= External Support, VE= Visitor's experience, SA=Safety, NP= Nature Preservation, PROF= Profitability, SOA= Social Aspect, ECA=Economic Aspect, ENA= Environmental Aspect