APPLICATION OF SPATIAL AUGMENTED REALITY FOR SUSTAINABLE TOURISM MANAGEMENT: A CASE STUDY OF NATURE BASED TOURISM IN JAPAN

MEIKO OKAMURA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF MANAGEMENT
IN INTERNATIONAL TOURISM MANAGEMENT
BURAPHA BUSINESS SCHOOL
BURAPHA UNIVERSITY
2024

-

MEIKO OKAMURA

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรการจัดการมหาบัณฑิต
สาขาวิชาการจัดการการท่องเที่ยวระหว่างประเทศ
คณะบริหารธุรกิจ มหาวิทยาลัยบูรพา
2567

APPLICATION OF SPATIAL AUGMENTED REALITY FOR SUSTAINABLE TOURISM MANAGEMENT: A CASE STUDY OF NATURE BASED TOURISM IN JAPAN

MEIKO OKAMURA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF MANAGEMENT
IN INTERNATIONAL TOURISM MANAGEMENT
BURAPHA BUSINESS SCHOOL
BURAPHA UNIVERSITY
2024

The Thesis of Meiko Okamura has been approved by the examining committee to be partial fulfillment of the requirements for the Master Degree of Management in International Tourism Management of Burapha University

Advisory Committee

Principal advisor

.....

(Assistant Professor Sakchai Setarnawat)

Examining Committee

..... Principal examiner
(Assistant Professor Apinya Ingard)

..... Member
(Assistant Professor Sakchai Setarnawat)

..... Member
(Tinikan Sungsuwan)

..... Dean of the Burapha Business School
(Assistant Professor Punnee Pimapunsri)
.....

This Thesis has been approved by Graduate School Burapha University to be partial fulfillment of the requirements for the Master Degree of Management in International Tourism Management of Burapha University

..... Dean of Graduate School
(Associate Professor Dr. Witawat Jangiam)
.....

62920003: MAJOR: INTERNATIONAL TOURISM MANAGEMENT; M.M. (INTERNATIONAL TOURISM MANAGEMENT)
KEYWORDS: Sustainable Tourism Management, Spatial Augmented Reality, Nature-based Tourism

MEIKO OKAMURA : APPLICATION OF SPATIAL AUGMENTED REALITY FOR SUSTAINABLE TOURISM MANAGEMENT: A CASE STUDY OF NATURE BASED TOURISM IN JAPAN . ADVISORY COMMITTEE: SAKCHAI SETARNAWAT, Ph.D. 2024.

The purpose of this research is to identify the factors affecting to adopt Spatial Augmented Reality(SAR) in Nature-based Tourism(NBT) and to find out the relationship between SAR and sustainable tourism management(STM) in the case of Japan. The research was conducted as a quantitative research with the sample of 402 participants by convenience sampling and purposeful sampling method. Reseacher distributed the questionaire online by e-mail and direct messages through social networking systems directly sent with URL of a google form. The conceptual model was used in this study with independent variables namely Technological context(TC), Organizational context(OC), Environmental context(EC), Spatial Augmented Reality adopted in Nature-based prodcut(ARNBT), and Sustainable Tourism Management(STM). As a result, EC had significant effect to ARNBT while TC and OC were insignificant in the case of Japan and ARNBT had significant effect to STM with social, economic, and anvironmental aspects. To conclude, environmental context such as competitive pressure and government pressure can positively effect to adopt SAR in nature-based product. Moreover, from the management perspective, economic aspect is considered well as one of sustainable tourism management along with social aspect.

ACKNOWLEDGEMENTS

First and foremost, I would love to express my gratitude to my classmates, friends and family who always support and motivate me for the study of my master's degree at Burapha Business School, Burapha University as well as Assistant Professor Dr. Sakchai Setarnawat to be my advisor and for kindly advising me for my research and giving all productive thoughts of tourism study, Dr. Tinikan Sungsuwan for kindly supporting my study in master's degree and Assistant Professor Dr. Petcharut Viriyasuebphong for giving me guidance with her extensive knowledge.

I would love to show my appreciation to every lecture who gave me new insights and knowledge in business with their valuable experiences.

I am thankful to all staff of Burapha Business School, Burapha University, for giving me warm help and support always to achieve my study in Thailand.

Lastly, special thanks to the 402 respondents in the study who answered my questionnaire with their valuable time. Without their contribution, I couldn't complete the research and the result didn't show up. I believe everything I leaned through this study will benefit in the future. I would love to show my appreciation from bottom of my heart to all the people who were part of my study.

Meiko Okamura

TABLE OF CONTENTS

Page

List of tables

Page

List of figures

Page

CHAPTER 1
INTRODUCTION

This chapter aims to introduce overall direction of this research, which includes the research background, problems, objectives, and benefit. The author also clarifies definition of the terms used and the scope of this research.

After reading this chapter, the readers will understand necessity, importance, and contribution of this research towards future tourism development by following sections:

- Background of research and statement of the problems
- Research questions
- Research objective
- Contributions of the study
- Scope of the research
- Definitions of terms
- Structure of the study

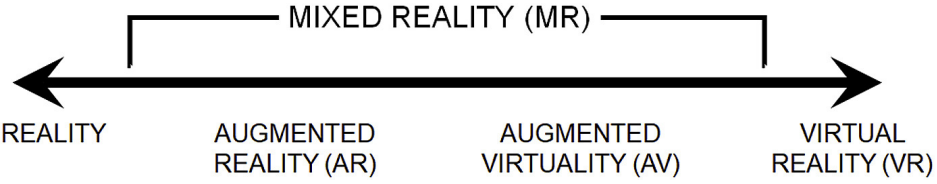
The chapter provides readers clear outline for this research's direction and help them to understand the process of building the framework of this research in the next chapter.

Background of research

Currently, innovation with technology towards sustainability is considered as an essential component for the growth in the business. Tourism industry is no exception (Alsos, Eide, & Madsen, 2014; Evans et al., 2017; Genc, 2020; Hjalager, 2015; Ratten & Braga, 2019; Weiermair, 2006). As it has many small-sized enterprises and the competitiveness is severe, the need of innovation to get the competitive advantage is highly expected in the current tourism industry.(Hansen, Hjalager, et al., 2019) However, due to its complementary relationship between technology and sustainability, as well as the complexity of the technology and rapid development, the relationship in tourism innovation, technology and sustainability is still largely lack of the research in the field alongside rapidly growth in need.(Ratten & Braga, 2019)

Considered to be an innovation in tourism, digital technology offers the new opportunities to increase the level of immersion in the tourist experience in order to add more value in existing tourism resources. Notably, the appearance of the mixed reality has changed the way of interaction between people and technology, lay overing the line between reality and the virtual world such as augmented reality (AR) and augmented virtuality(AV) in the category of mixed reality (Figure 1). (Bec, Moyle, Schaffer, & Timms, 2021; Bec et al., 2019; Flavián, Ibáñez-Sánchez, & Orús, 2019)

Figure 1. Reality-Virtuality continuum



Source: Bec et al. (2019); Milgram and Kishino (1994)

In the context of tourism, AR has been seen recently combined with existing resources (Bec et al., 2019; Bran, Bautu, & Popovici, 2020; Kyriakou & Hermon, 2019; Revellat, 2019) and it is expected to obtain sustainability as an innovative preservation method(Bec et al., 2021). AR is a mixed reality which has more emphasize in the construction on the real elements or environment with digital technology that provides high-level visitor's experience. Currently, AR which uses 3D objects to project the digital world named Spatial Augmented Reality (SAR) is widely used for museum, deteriorated heritages, events, and attractions in theme parks. (Bec et al., 2021; Bec et al., 2019; Mine, Van Baar, Grundhofer, Rose, & Yang, 2012) (Figure 2)

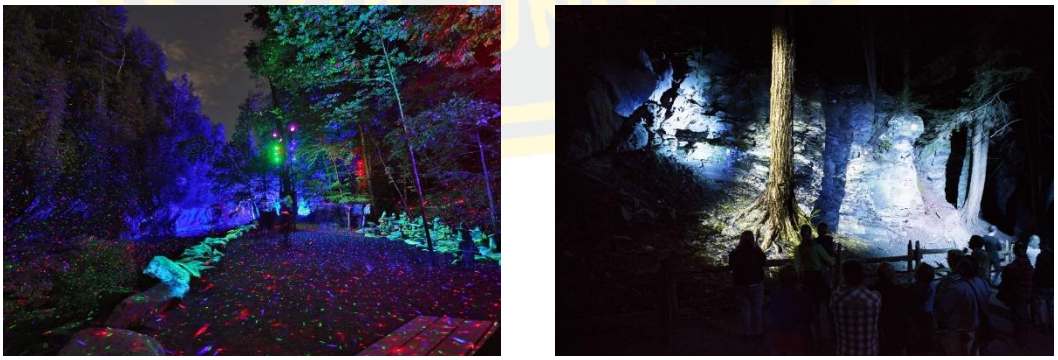
Figure 2. Digital Art Museum in Odaiba Tokyo

Cited from: teamLab Boderless

As peoples' environmental awareness is growing up currently (Smith-Christensen, 2009), the digital technology which covers the real environment, SAR has been implemented in natural environment in rural area. "Lumina series" is nature-based multi-media attraction created by Moment factory which is basically a nighttime walk in the field of nature featured by cultural context and SAR technological effect (Figure8). In 2014, the first Lumina series "Foresta Lumina" was

carried out in the national park by “Parc de la Gorge de Coaticook” in Quebec, Canada. “Parc de la Gorge de Coaticook” is a non-profit organization which attracts visitors with outdoor activities. “Foresta Lumia” is a nighttime walk along 1.5 mile in the forest and participants follow the story which was inspired by forest mythology and local legends. Following the story in the dark forest, SAR technological effect such as audio effect, lighting effect and 3D projection mapping, projected 3D hologram entertains participants. “Foresta Lumina” has become a popular attraction and received Thea Award for Outstanding Achievement - Interactive Attraction, Limited Budget in 2016 by TEA (Themed Entertainment Association). It was appraised the adaptation of modern technologies to a living environment aiming at giving to the visitor a unique experience, but also preservation of the park’s natural resources. In addition to it, it also resulted in a significant impact on local economy. Thea Awards noted that there was an 80% increase in tourism to the park, 200% increase in business for local restaurants, and 100% increase for local hotels.

Figure 3 SAR in the First Lumina Series of Coaticook National Park

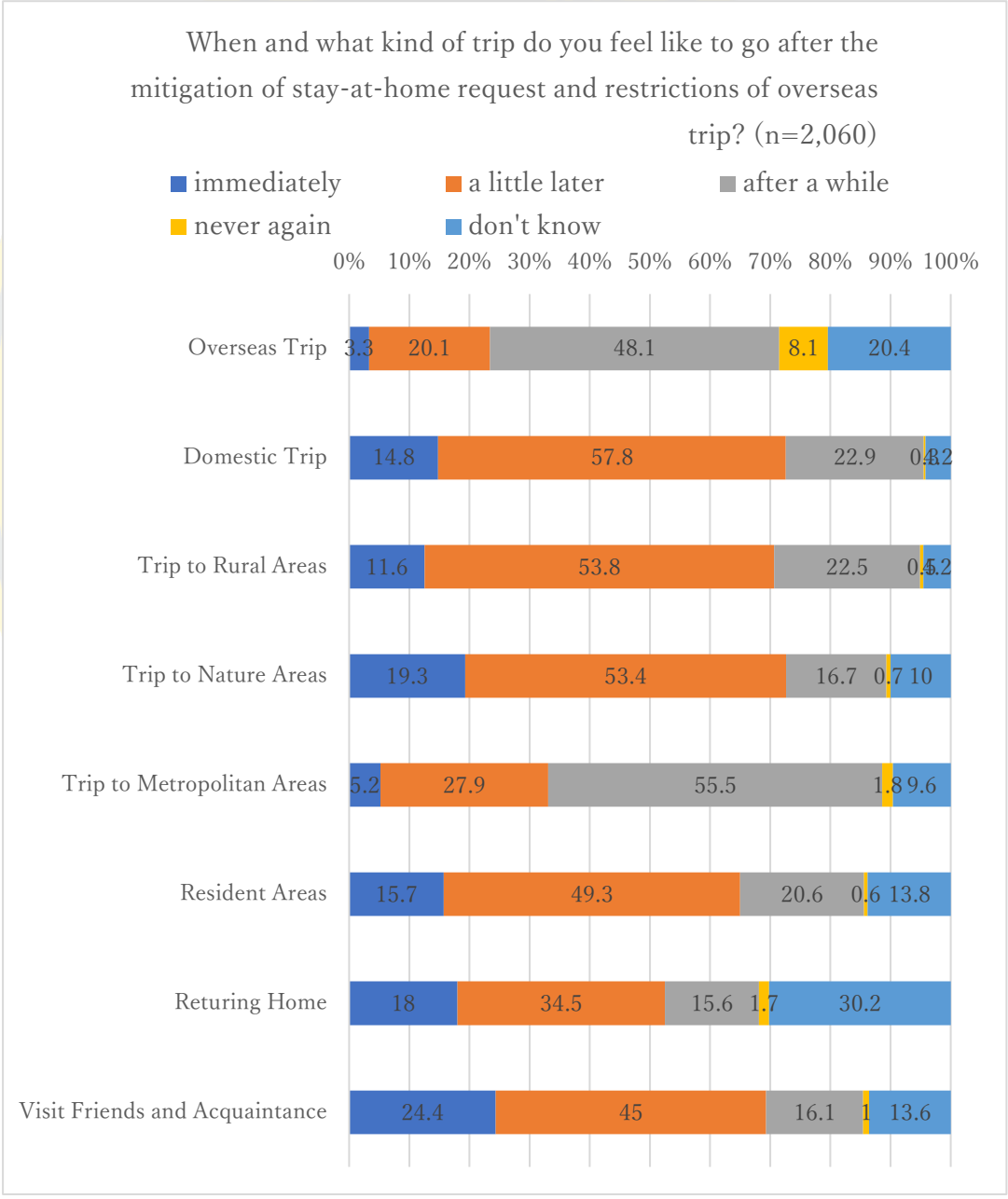


Cited from Foresta Lumina, Moment Factory

Currently, tourism attractions combined SAR with natural resources are observed in Japan. These cases represent SAR adopted onto the natural resources by each local organization with low-level physical activity by presenting cultural information of that region. Moreover, visitor's experience was enhanced by interaction with natural resources and easy physical activities as night walk and the activities were created without language barriers for the international tourists. Natural phenomena and activities in nature are growing up rapidly and becoming popular market segment in tourism section.(Sand & Gross, 2019) Unexpectedly, COVID-19 pandemic situation boosted the additional outbreak on tourists' demand for nature-based tourism. (Fredman & Margaryan, 2020) In Japan, according to the attitude survey conducted by JTB in 2020 shows consumers' demand is also shifting to a travel to the regions with a lot of nature and travel to rural area with less population (Figure4) under the COVID-19 situation. Since 2012, Japan has been promoting the inbound tourism and it resulted in significant growth of the tourism by 2019 (Figure5). The questionnaire conducted for 20 nationals and regions in 2018 by Japan Tourism Agency (Figure6) towards inbound tourists also supports the fact that there is a clear trend and growth market for nature-based tourism context (marked as green in Figure6) and shows "experiences derived from nature" was observed in significant portion. Nature-based tourism with outdoor activities is recently appeared as a niche tourism sector which is constructed on natural resources as a part of nature-based tourism (Fossgard & Fredman, 2019) to be one of the most rapidly growing sectors in present tourism industry and expected for further future growth (Knowles, 2019). Nature-based tourism with outdoor activities is recognized as its ecological, cultural, and economic value (UNWTO, 2014) and because of these characteristics, the outcome of

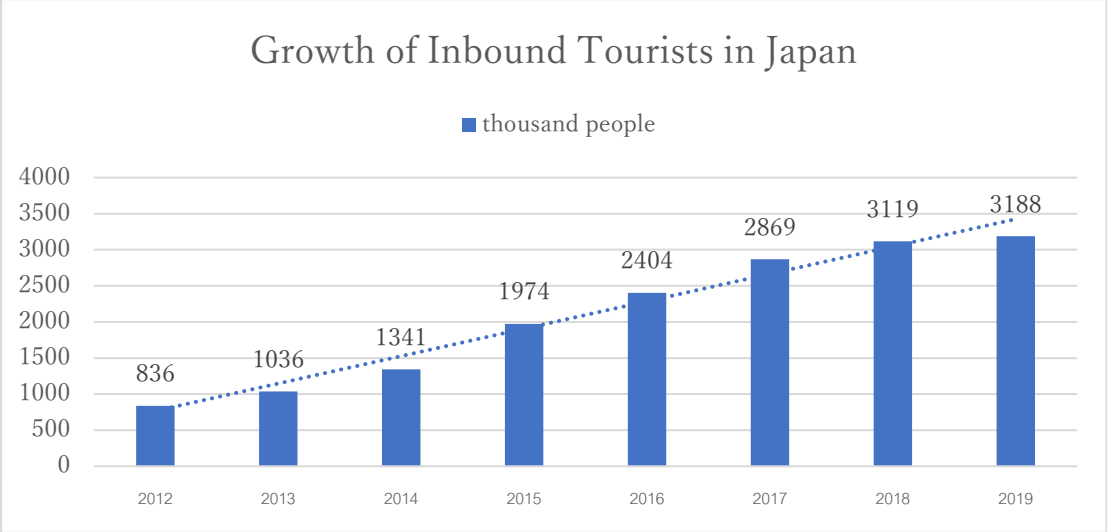
sustainability is closely related to its management and not yet to be explored through a conceptual sustainable tourism framework (Knowles, 2019).

Figure 4. Attitude survey towards resume of traveling and changes in peoples' life or mindset according to COVID-19 infection spreads



Source: JTB Tourism Research & Consulting Co., 2020

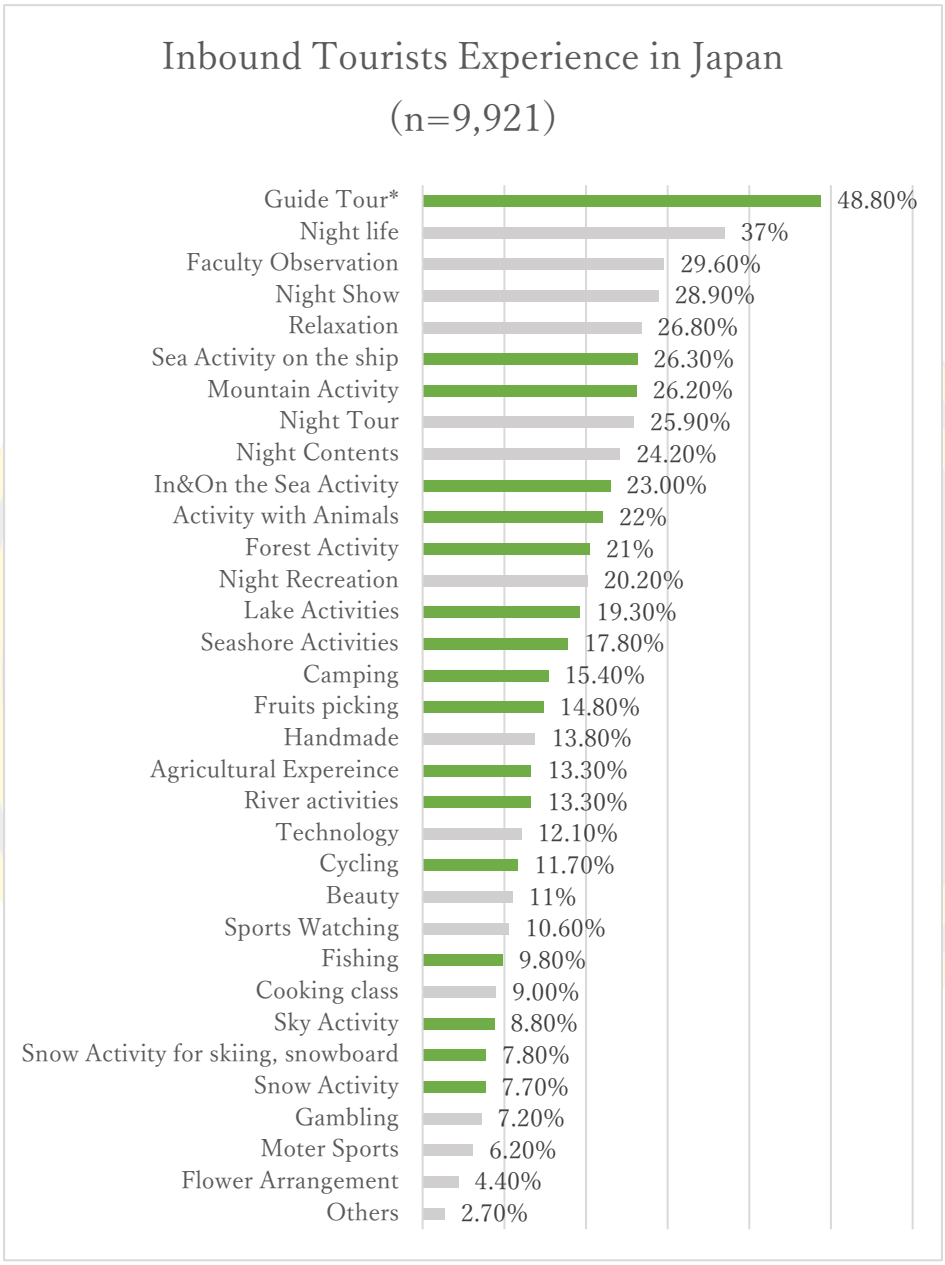
Figure 5. Growth of Inbound Tourists in Japan



Source: Japan National Tourist Organization (JNTO), 2019 cited by Ministry of Land, Infrastructure, Transport and Tourism (2019)

The intension to visit Japan after the pandemic has high popularity among people from other countries (Figure7). In Figure8, comprehensive expectation of Japanese inbound tourism after COVID-19 was surveyed towards prospective inbound tourists in Asia, Europe, America, and Australia. Regarding these facts, policy plan was suggested at the governmental 41st promotion conference for tourism strategy implementation in 2020. The government announced the directions such as promoting tourism resources such as nature, culture, and food (snow resorts, nature-based tourism etc.) and utilizing digital technology to refine the tourism resources such as culture, art and nature to enhance visitors' experience and actual bodily sensation.

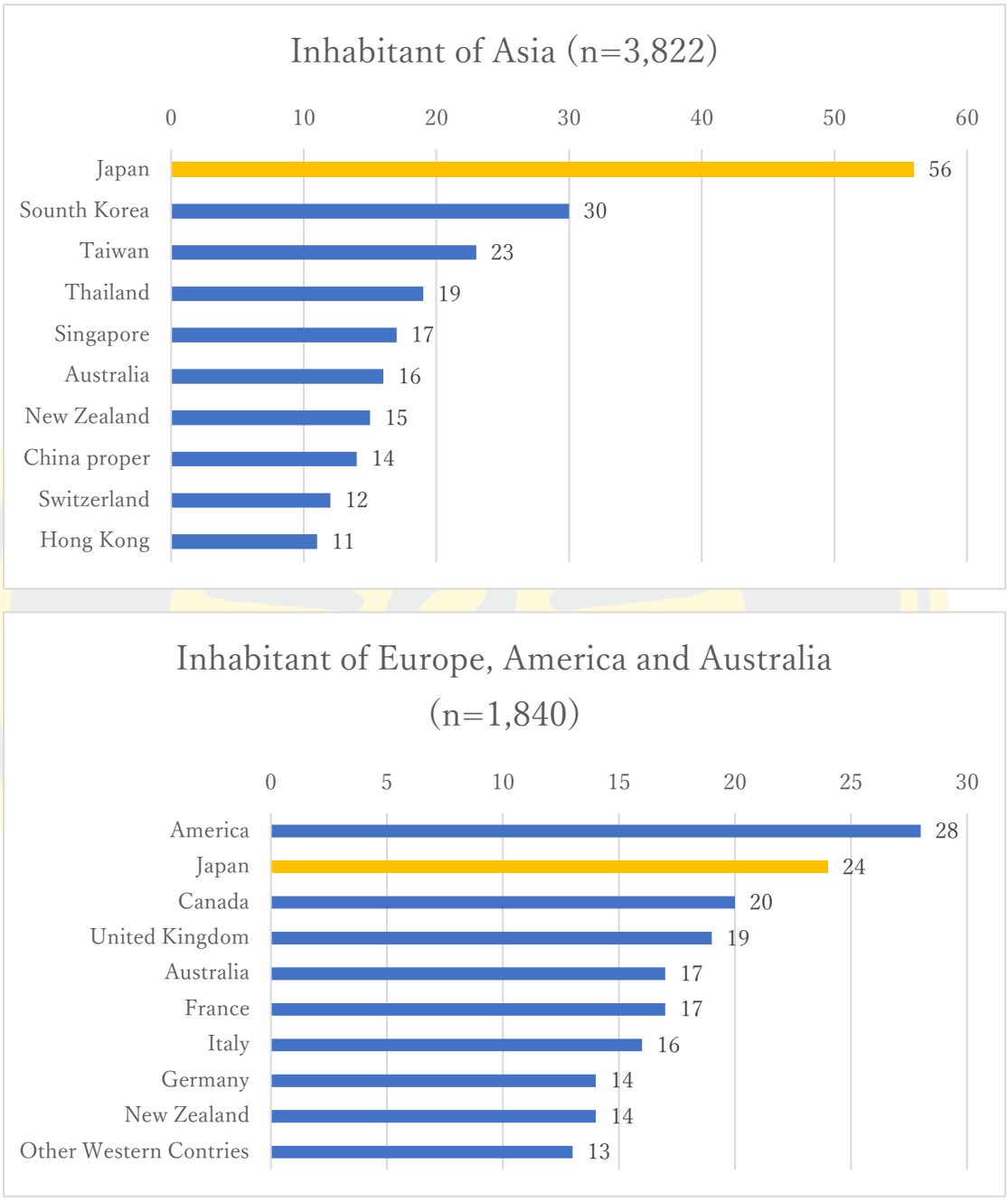
Figure 6. Inbound Tourists Experience in Japan



*Guide Tour contains tours with not only nature-oriented activities but also experience activity.

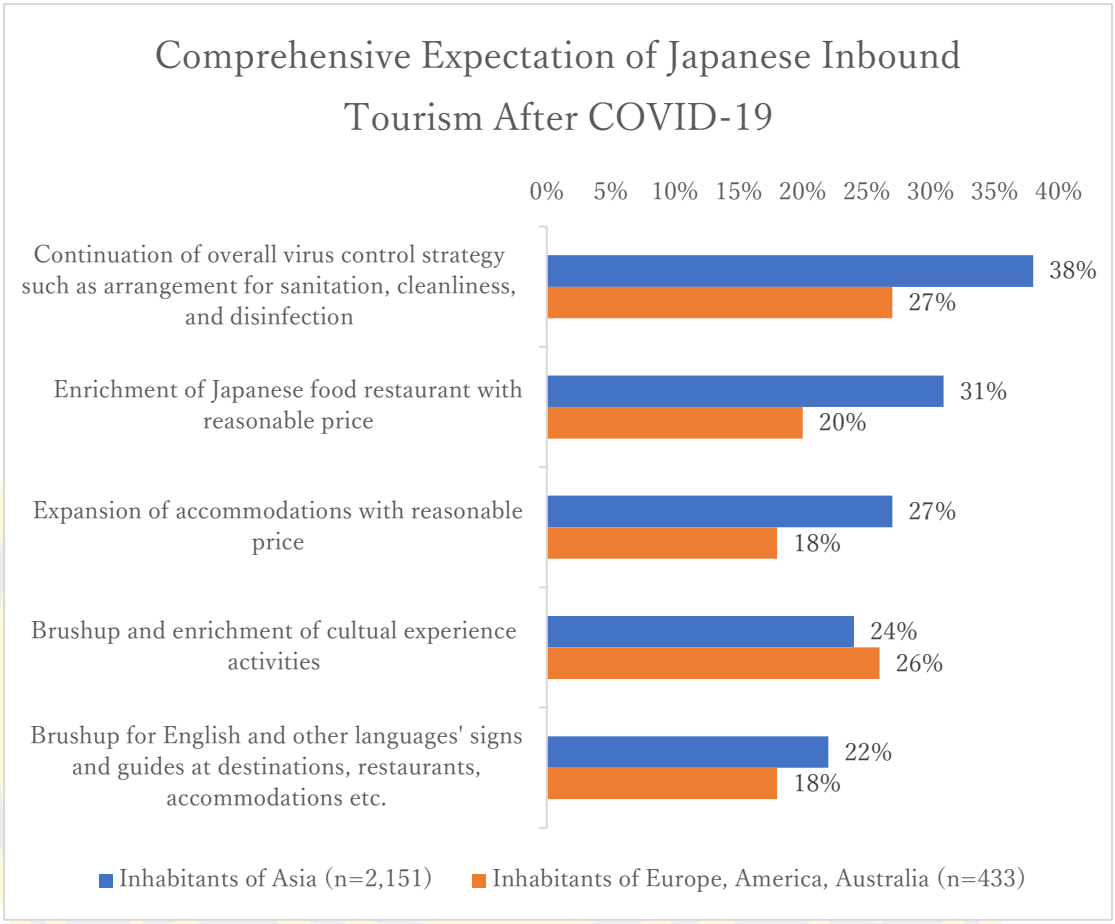
Source: Japan Tourism Agency 2018; 2019

Figure 7. Preferred Countries and Regions for Tourism Visit After Covid-19



Source: DBJ. JTBF. Special Intention Survey (Influence by COVID-19 in 2020) on Inbound Tourists of Japan in Asia, Europe, America, and Australia (Development Bank of Japan, Japan Travel Breau Foundation, 2020)

Figure 8. Comprehensive Expectation of Japanese Inbound Tourism After COVID-19



Source: DBJ. JTBF. Special Intention Survey (Influence by COVID-19 in 2020) on Inbound Tourists of Japan in Asia, Europe, America, and Australia (Development Bank of Japan, Japan Travel Breau Foundation, 2020)

As the background of these movements, the enormous increase in importance of sustainability in tourism management continues over the past few decades (Pröbstl & Haider, 2013; UNWTO, 2012). In 2019, for further development of tourism, the ministry announced its importance in sustainable management according to the significant and expected growth of inbound tourists in Japan. In addition, the ministry announced the list of problems in sustainable management of Japanese cases and its lack of the research in management perspective towards sustainable tourism management based on indicators of sustainable development made by UNWTO (2004) (Ministry of Land, 2019). The investigation by the Japanese government towards sustainable tourism was published using a guidebook "Indicators of Sustainable Development for Tourism Destination" established by UNWTO in 2004 (Appendix A). The indicators are to measure the presence of problems, size of problems, signs of problems, the need of treatment, etc., and put emphasis on grasping state changes through monitoring of index values. DMO plan stands for Destination Management / Marketing Organization. The cases of problems were found from the online newspapers to generalize about the issues. The problems are observed at the most in "wellbeing of host communities" such as buying-up daily necessities, unmannerly behaviors, traffic congestion, limitation to access major local resources. In "tourist satisfaction", reduced satisfaction of visitors from particular countries and troubles caused by not knowing Japanese customs resulted in satisfaction reduction. The issues in "health and safety" were seen in accidents caused by not knowing Japanese traffic and mountain climbing rules. In "capturing economic benefits from tourism," articles on seasonality associated with the concentration of tourists, problems of leakage in which economic benefits from

tourism are leaked and economic benefits including employment problems such as labor shortages were found. The article about the regulation on entering a mountain area as a problem found in "protection of valuable natural assets" was seen. For "limiting environmental impacts of tourism activity," articles about increasing garbage, noise, and destruction of landscapes were observed. Many articles related to transportation such as traffic accidents, on-street parking and congestion were found as “destination planning and control."

According to the result, there are initiatives and KPIs in multiple categories and various items. On the other hand, there are items in tourism policy and KPIs that are not addressed much, such as "level of community satisfaction ", "access by local residents to key assets " and "contentment from work" despite the presence of problems. Since some items such as quality of sewage treatment and drinking water is already in place in Japan, there are not conspicuous actions taken. Besides, the measurement is targeting tourism-related plans in cities and villages, however, there are some items that are considered to be being addressed in wide-area administration from the other fields, such as "protection of valuable natural assets", "managing scarce natural resources", and environmental impact such as "air transportation".

On the basis of the result, the ministry announced that for Japan to become a tourism advanced country and make tourism sustainable, it is necessary to focus on the fact that tourism affects not only the economy but also local communities and the environment (both in positive and negative way), and work from the viewpoints of economy, local communities, and the environment in cooperation with measures in other fields such as environmental policy and management perspectives are also important.

While the expectation in high growth of NBT is also officially announced by Japan Tourism Agency (2019), the demand with the products which have easy physical interacted activities are grwon. (ATTA, 2018). Challenges in NBT were addressed in three aspects in sustainability and the way of product innovation that managing influence on natural resources by Pröbstl and Haider (2013). Yet Hansen, Hjalager, and Fyall (2019) stated that an innovation in NBT has effects to promote sustainability, hence considering the sustainable tourism management, innovation is considered as a key to success in sustainability in the context of tourism. (Alsos, Eide, & Madsen, 2014; Evans et al., 2017; Genc, 2020; Hjalager, 2015; Ratten & Braga, 2019; Weiermair, 2006) Additionally, since tourism industry has many small-sized enterprises and competitiveness is severe, the need of innovation to get the competitive advantage is also expected.(Hansen, Hjalager, et al., 2019) Tourism industry has been the first application platform for new technological innovation which generate new markets and products and its complementally relationship between technology and sustainability (Ratten & Braga, 2019). The implementation of innovation in tourism heavily relays on technology in product or services adopted from other organization as partnership (Hansen, Hjalager, et al., 2019; Sand & Gross, 2019). However, the relationship in tourism innovation, technology and sustainability is still largely lack of the research in the field alongside rapidly growth in need.(Ratten & Braga, 2019) As the matter of fact, Japanese government is focusing to promote NBT initiatives by utilizing digital technology to improve the quality of the tourism resources for the tourists with high-value added experience for future sustainability in tourism. (JTA, 2020) However, Hunt and Harbor (2019) stated that NBT is not innately sustainable. Yet conceptual similarities are observed with

sustainable tourism, its challenges still lay on each sustainable aspect; social, economic, and environmental. To overcome these challenges, revealing the way of product innovation in NBT is required. In the context of NBT, a previous research stated that enhancing visitor's experience is counted as the primary factor to design and install the technologies which can be innovation to obtain the sustainability (Hansen, Hjalager, et al., 2019). While the precise relationship between technology in tourism innovation and sustainable management in the context of NBT is still largely lack of researches. (Knowles, 2019), NBT product modified by digital technology, SAR, has appeared in the industry and its significant economic benefit towards local region was observed. The innovation by digital technology has got the expectation in tourism industry and the government as sustainable method and the recovery from current situation by COVID-19, however, as mentioned above, it largely lacks in the academic research due to the newness and its complexity. Considering Japanese government announcements on the expectation of NBT growth in Japan, tourism enrichment by digital technology, problems of sustainable tourism management in Japan and the lack of the research with Japanese cases in the management perspective, the researcher states that studying the point where the case of SAR adopted NBT can contribute the development of tourism industry in Japan.

Therefore, this research aims at revealing and finding out what factor affecting to adopt the digital technology, SAR on natural resources in the context of NBT product and the relationship between SAR adoption and sustainable tourism management in Japan by using quantitative method research.

Statement of the problems

1. Nature-based tourism product with the specific context of SAR has not yet studied.
2. Not clarified the effect of SAR in nature-based tourism product onto Sustainable Tourism management.
3. Ministry of Land, Infrastructure, and Transport of Japan stated that lack of study in Japanese cases for managing sustainability in management perspective.
4.

Research Questions

Based on the problem statement, the researcher poses research questions as following.

1) What kind of factors affect to adopt SAR in nature-based tourism?

2) How adoption of SAR effects to sustainable tourism management in Japan?

Research Objectives

Based on research questions, objectives in this research are stated as following.

1) to identify the factors affecting to adopt SAR in nature-based tourism in Japan.

2) to find out the relationship between SAR and sustainable tourism management in Japan.

Contributions of the study

1. To develop the model of the relationship between SAR and sustainable tourism management.
2. To give the guideline for usage of SAR towards sustainable tourism management.

Scope of the research

The main purpose of this research is that to contribute the future development of tourism industry in Japan to find out the factors affecting in adaptation of SAR digital technology onto NBT product and its impact on tourism sustainable management in Japan. Hence, based on the purpose of the study, the researcher determined scope of the study as following:

Theory: In this study, TOE framework was employed to examine the factors affected on adaptation of SAR technology. Theory to examine sustainable management is based on definitions established by UNEP and UNWTO (2005) and follows previous researches mentioned about the relationship between innovation, NBT, and sustainable management.

Place and time: The geographic location for this study is based on the chosen cases in Japan, however data is collected by online. The questionnaires were distributed and collected during October in 2021 to December in 2022.

Population and sample size: Population and sample size for this study refer to the stakeholders that have rich knowledge in SAR, tourism management and NBT products in Japan and a combination of convenience sampling and purposeful sampling method was employed.

Definition of the terms

Concerning the study there are some terms used by the researcher are defined as following.

- Spatial Augmented Reality (SAR): The digital technology that modifies real environment which is "augmented" by projecting virtual objects.
- Nature-based Tourism (NBT): Tourism that is combined with natural materials and phenomena. It is a niche tourism sector that contains all of tourism activities related to nature such as green tourism, eco-tourism and adventure tourism.
- Sustainable Management (STM): Managing the tourism operations regarding sustainable tourism. Tourism that involves considering current and future economic, social and environmental impacts while satisfying the demands of visitors, industries, the environment and the communities that accept visitors in the region. The principles of sustainability must also apply to the environmental, economic and socio-cultural aspects of tourism development, ensuring an appropriate balance between these three aspects and their long-term sustainability.
- Technological context: The perspective that the technology possesses in its systems and designs.
- Relative Advantage: The benefits that characteristic of the technology can bring better compared to before or the original.
- Compatibility: The level of compatibility which the technology suits to the existing values and needs of the receivers.
- Complexity: The level of perceived difficulty which the technology is

relatively difficult to understand or use.

- Organizational context: The characteristic of the organization and internal factors that impacts on the adaptation of the technology.
- Firm size: The level of capital, revenue and the number of employees within the industry.
- Top management support: The level of top management support or positive intention towards the adoption of the technology.
- Competency: The level of employees' knowledge and capability to install the technology.
- Financial cost: The capability of adopting the technology regarding the spending financial cost.
- Environmental context: The external factors that can affect the adoption of the technology.
- Competitive pressure: The level of pressure from competitors in the industry.
- Government pressure: The level of pressure from the government such as announcement or policy.
- External support: The level of necessity of supports from business partners or relative associations.
- Adoption of SAR technology in NBT product: A tourism product that is installed SAR technology onto the product using natural resources.
- Visitor's experience: The level of enhancement in visitor's experience with SAR adopted NBT products.
- Safety: The level of safety for both visitors and employees in the activity of SAR adopted NBT products.

- Nature preservation: The level of effect to preserve nature and environment by SAR adopted NBT products.
- Profitability: The level of benefit in the profit made by SAR adopted NBT products for the organization.
- Sustainable tourism management: Sustainable condition of the region which social, economic, and environmental dimensions are equally managed.
- Social aspect: To manage tourism activities with respect to the society, culture and communities of the region and conserving their life and traditional values towards future sustainability.
- Economic aspect: To manage tourism activities considering the long-term economic operations and equally distributed socio-economic benefit to all stakeholders such as stable employment, income-earning opportunities, and social services to host communities.
- Environmental aspect: To manage tourism activities by environmental resources with the concern of nature preservation in developing the tourism and utilize its activity to help conserving natural heritage and ecosystems.

Structure of the study

The study is structured into five chapters:

Chapter 1 presents the background of research and statement of the problems, research questions, research objective, contributions of the study, scope of the research, definitions of terms, and the structure of the study.

Chapter 2 delivers review from the previous relevant studies to integrate the deeper knowledge to support theoretical framework. This chapter consists of details to

discuss of theoretical foundation, relevant findings of existed researches about nature-based tourism and adventure tourism, augmented reality in tourism, sustainable management, and tourism innovation.

Chapter 3 explains the research methodology of the study to embody the research in more realistic way by defining population and sample size also introducing key informants and research instruments. The method of analysis is also shown in the chapter.

Chapter 4 elaborates the results of the study.

Chapter 5 discusses about the result of data collection and future perspective under the limitation

CHAPTER 2
LITERATURE REVIEWS

This chapter provides knowledge to construct theoretical framework by previously studied theories. The supports from fundamental literatures help this research to be more consolidated. The chapter consists of a theory regarding adaptation of technology in organization as innovation and sustainability outcome alongside with strong relationship between innovation and sustainable management. Therefore, this chapter subdivided with review of related literatures on nature-based tourism and adventure tourism, sustainable management, tourism innovation, theoretical foundation of this research, and conceptual framework. The aim of elaborating on these concepts are to

- provide the theoretical backup on the purpose of this study,
- explain the relationships of each component in this research,
- exploring the previous researches in the related fields,
- convince the importance of outcome by this research, and
- find the ways of thinking in doing this research.

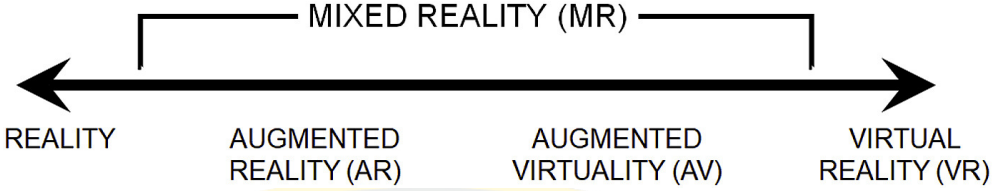
Spatial Augmented Reality (SAR)

Currently, NBT product with new digital technology which covers the real natural environment, Spatial Augmented Reality (SAR), has been implemented in rural area as an attraction. SAR is an effective illusion with virtual object projected onto real environment, which is a type of augmented reality(AR), does not require any devices to combine both dimensions so that directly integrated. (Raskar, 1999)

The digital technology is getting more attention to be as innovation in various kind of industries (Flavián et al., 2019) and it offers the new opportunities to increase the level of immersion in the tourist experience and add more value in existing tourism resources. As the notable digital technology, augmented reality (AR) and augmented virtuality(AV) has emerged lay overing the line between reality and the virtual world, which so-called mixed reality (Figure 9) (Bec et al., 2021; Bec et al., 2019; Flavián et al., 2019). Compared to virtual reality (VR), SAR has a much stronger link to the real environment compared to the augmented virtuality.

In the context of tourism, Bec et al. (2019) noted that the expectation in AR stands in heritage preservation and enrichment of visitor's experience, which can also lead to cultural sustainability. At the most recently, Bec et al. (2021) proposed a concept of second chance tourism considering that AR to be the new innovative preservation method during COVID-19 situation and its outcome in high-level visitor experience.

Figure 9. Reality-Virtuality continuum



Source: Bec et al. (2019); Milgram and Kishino (1994)

Currently, AR has been seen in tourism combined with existing resources. (Bec et al., 2019; Bran et al., 2020; Kyriakou & Hermon, 2019; Revellat, 2019) AR is a mixed reality which has more emphasize in the construction on the real elements or environment with digital technology. As an operational definition of AR, Bimber and Raskar (2005) noted any case that modifies real environment which is "augmented" by virtual (computer graphic) objects can refer to AR. SAR is one of AR using projection mapping onto real environment, widely used for museum, deteriorated heritages, events, and attractions in theme parks (Bec et al., 2021; Bec et al., 2019; Mine et al., 2012). Bimber and Raskar (2005) defined SAR as “the use of projection technology to augment and enhance 3D objects and spaces in the real world by projecting images onto their visible surfaces.” SAR can overcome the technological and ergonomic limitations of conventional AR systems and thus attracts industry’s interest. (Bimber, 2005)

The notable case of SAR in tourism product, Lumina series are immersive nature-based multi-media attraction created by Moment Factory which is basically a nighttime walk in the field of nature featured by cultural context and technological effect.

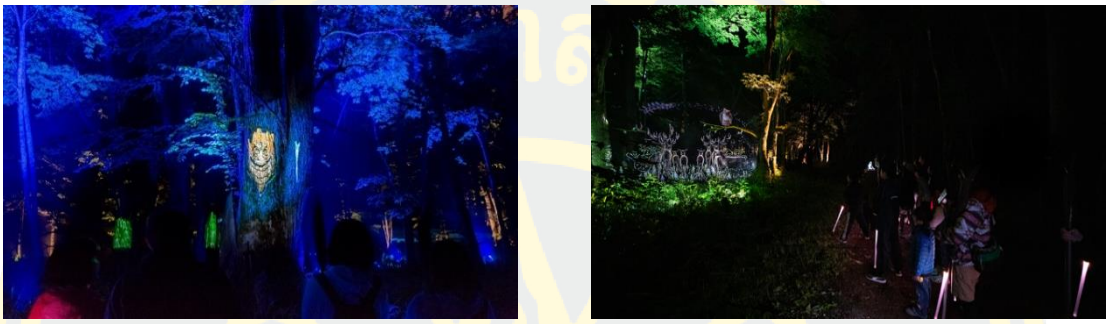
In 2014, the first Lumina series “Foresta Lumina” was carried out in the national park by “Parc de la Gorge de Coaticook” in Quebec, Canada. “Parc de la Gorge de Coaticook” is a non-profit organization which attracts visitors with AT

outdoor activities e.g. hiking, camping, mountain biking and some winter activities. “Foresta Lumia” has been counted as their main attractive activity for tourists since 2014. It is a nighttime entertainment walk along 1.5 mile in the forest of national park. Participants are distributed a map to follow the story which was inspired by forest mythology and local legends. Following the path and the adventurous story in the dark forest, some technological effect such as audio effect, lighting effect and projected SAR on natural resources entertains participants and leads them to immersive tourism experience. “Foresta Lumina” has become a popular attraction and received Thea Award for Outstanding Achievement - Interactive Attraction, Limited Budget in 2016 by TEA (Themed Entertainment Association). It was appraised the adaptation of modern technologies to a living environment aiming at giving to the visitor a unique experience, but also preservation of the park’s natural resources. In addition to it, it also had a significant impact on local businesses. At the Thea Awards annual event, it was noted that there was an 80% increase in tourism to the park, 200% increase in business for local restaurants, and 100% increase for local hotel as sustainable outcome.

In 2018, Japanese organization in Nagasaki prefecture adopted the “Lumina series” in Io island where considered as a rural area where the surface of the land is 2.18 km² and total population is 661(*Total Population Data in Nagasaki Prefecture*, 2020). It was built with the combination of about 800 meters nighttime walk in the forest of Io island with cultural context such as scenery and regional legends aiming at increase in local economy. In Hokkaido, another Lumina series was adopted as Kamuy Lumina in 2019 by Adventure Tourism organization in Hokkaido. In the Forest of Lake Akan, in Akan Mashu National Park, Hokkaido, they created a new

attraction with a 1.2 km walking path featured by SAR effects following the story of the land of the Ainu gods.

Figure 10 Island Lumina in Nagasaki



Cited from Island Lumina facebook page

Figure 11 Kamuy Lumina in Hokkaido

Cited from Tsuruga Group

These cases represent NBT with soft adventure product such as nighttime walk in the forest augmented by technological effects with SAR technology. According to the announcement by Nagasaki prefecture, their expectation in implementation of this attraction is increase local economy gaining more inbound tourists. The emergence of SAR technological innovation in NBT united with natural resources in safer activity is

observed in Japan. Hence, this study aims to find out the reason of the appearance of the products and relationship with sustainable management.

Tourism Innovation and Sustainability

Innovation is essential to the long-term sustainability of tourism, assuming such new technologies and operator adaptations (Divisekera & Nguyen, 2018). Ratten and Braga (2019) stated that tourism innovation has complementary relationship between technology and sustainability. There are various kinds of technology implemented in tourism sector as innovations and the performance is expected to be sustainable.

Generally, innovation has been recognized as a critical tool for competitiveness among tourism companies and destinations (Hjalager, 2015). The early theory of innovation was developed by Schumpeter in 1984 that innovation is understood in terms of the generic definition that the generation, acceptance and implementation of new ideas, processes, products or services with the new combinations of production factors such as the production of new goods, the introduction of new processes, the opening of new markets, the access to new sources of raw materials and intermediates, and the reorganization of an industry (Schumpeter, 1984).

Based on the innovation theory, Weidenfeld, Williams, and Butler (2010) stated that tourism attraction innovation mainly considered to be two categories: incremental and radical innovations. Improved products or processes adopted to existing processes and procedures are incremental innovations, whereas radical innovations are completely new processes or products introduced (Alsos et al., 2014).

Furthermore, tourism innovation is often likely to occur continuously to meet the need to quickly adapt the experience of needs between organizations, with less trial, observability and complexity (Williams & Soutar, 2009). Hansen, Hjalager, et al. (2019) insisted that the innovation process of attractions is more innovative and complex from many sources than other tourism companies.

Generally, innovation is perceived to provide organizations a source of competitive advantage in business sector to satisfy demand of changing consumer (Hjalager, 2015). Besides, by accepting innovation, small or organizational organizations can develop local economies and preserve culture alive (Cefis & Marsili, 2006; Tohãnean, Buzatu, Baba, & Georgescu, 2020).

Tourism is quickly adopting most new innovations that generally arise through collaboration and external inspiration (Hjalager, 2015). The adoption of innovative ideas and products relies heavily on the effects from technology and material suppliers, rather than being self-invented (Hansen, Hjalager, et al., 2019). Innovation is generally expensive, and this provided an explanation for why it is a predominantly large organization within tourism that is likely to innovate and the stakeholders plays important role in the adoption (Soames, Brunker, & Talgaswatta, 2011 cited in Hansen, Hjalager, et, al., 2019). Since tourism industry has barriers and challenges more than accelerators to innovation because of the fragmented characteristic of tourism industry (Weidenfeld et al., 2010). In fact, it is challenging to existing organizations to implement new innovative ideas which relays on other existing entrepreneurship and recently formed organizations (Rodríguez, Williams, & Hall, 2014).

Hence, tourism innovation aims at sustainability to get the competitive advantage as business and the implementation of innovation in tourism heavily relays on technology in product or services as incremental innovation adopted from other organization as partnership. Currently, although innovation in NBT is posed as technology-driven in product (Hansen, Hjalager, et al., 2019; Sand & Gross, 2019), it is still largely lack of the research in the field alongside rapidly growth in need.

Table 2 shows summary of related findings about tourism innovation in NBT about sustainability. Expectation and possibility of technology to manage sustainability is considered to be innovation in tourism industry. Additionally, NBT product which has managed safety and low level of danger can lead to sustainability and enhancing participant's experience is essential as innovation in NBT.

Table 1 Relevant Findings and the Terms

Authors (Year)	Relevant Findings	Related Terms
Ratten and Braga (2019)	New technological innovation generates new markets and products in tourism. The innovation in tourism has complementary relationship with sustainability and technology. Suggested future Researches includes reasons for sustainability innovation in tourism firms, how tourism creates new technology innovation.	- Technology - Innovation in Tourism - Sustainability
Edgell Sr (2016)	Concerns of safety and security is an extremely important issue in the tourism industry in the view of sustainable management and new technology is expected to support the safety of tourists.	- Sustainability - Safety - New Technology

Hansen, Hjalager, et al. (2019)	In adventure tourism, safety is a contributing factor that stimulates innovative activity alongside with participants' experience. Safer adventure tourism leads to long-term sustainability. Adventure tourism organizations innovate product with technology to improve the participants' safety and experience. Collaboration with technology suppliers is critical.	- Safety - Participant's experience - Nature-based Tourism - Tourism Innovation - Technology
Pérez, Guerrero, González, Pérez, and Caballero (2013)	Nature-based tourism is strongly related to sustainability because of its natural resources and local economic impact. By providing high economic returns and a high-quality visitor's experience leads to protecting the natural environment and improving the quality of life in community as sustainability.	- Nature-based tourism - Sustainability - Participants' experience
Japan Tourism Agency (2019)	Safety is an extremely vital component in adventure tourism compare to other factors in management perspective towards sustainability. It is directly related to business operation.	- Nature-based Tourism - Safety Management - Sustainability
Fossgard and Fredman (2019)	Two essential aspects as a dimension of risk management and participants' experience in adventure tourism.	- Nature-based tourism - Safety management
Knowles (2019)	Adventure tourism and sustainability strongly connected by the resources, residents, and cost for nature conservation.	- Nature-based tourism

	Suggested future research is how sustainable adventure tourism outcomes connect with global-scale objectives such as sustainable goals.	- Sustainability
Pröbstl and Haider (2013)	Management perspective in outdoor recreation and nature-based tourism can lead to development towards a sustainable manner. As future study, innovative concept, transdisciplinary planning methods, new theoretical applications and resilient management approaches are highly requested.	- Sustainability - Nature-based Tourism - Innovation
Sand and Gross (2019)	Needs in development of safety management in adventure tourism. Innovation should be tested focused only to guarantee participants' safety.	- Nature-based tourism - Innovation - Safety management
Genc (2020)	Business model innovation plays a key role in terms of sustainability especially in the context of tourism. The model revealed development of technology, total revenues in a specific tourism destination and the degree of environmental regeneration were linked. The impact of technology and environmental regeneration were assumed to be subject to same degree of change at a given time.	- Technological Innovation - Sustainability

Evans et al. (2017)	Business innovation impacts three sustainable dimensions uncertainly and behaviors of network members. A need of revealing value flows and exchanges, which could reveal opportunities for business model innovations and decline risk experimentation.	- Innovation - Sustainability - Risk Management
Dibra (2015)	The concept of sustainable tourism is new later developed after innovation theory. Innovation theory stands for new idea which can solve the problems. Thus, business of tourism in sustainability considered as engaging new idea which can be regarded as innovations.	- Tourism Innovation - Sustainability
Tohãnean et al. (2020)	In process of technological innovation, risks are inevitable and solving the risk management problem will lead to sustainability in the business.	- Technology Innovation - Sustainability - Risk Management
Hansen, Rogers, Fyall, Spyriadis, and Brander-Brown (2019)	Collaboration of stakeholders to overcome the problems in safety of adventure tourism in terms of risk management towards long-term sustainability.	- Nature-based tourism - Risk management - Sustainability
Moscardo (2008)	Current approaches to tourism and sustainable regional development have a number of problems and new solutions to these problems could come from using creative thinking methods.	- Technology Innovation - Risk management - Sustainability

Camison and Monfort (2012)	Tourism is fast platform to adapt technological innovation. Its necessity of development in a consolidated theoretical framework, clarification of specific methodological problems, and limitations to the public sources and models are posed when analyzing and measuring innovation in tourism. The results of the technological process of innovation, which is materialized in product-related innovations, can stem from the development or introduction of new materials, intermediate products, or new components or product features.	- Tourism innovation - Sustainability - Technological innovation in product
Rodríguez et al. (2014)	Tourism innovation is driven by incremental innovations mostly which consists the use of existing technologies in product. Social and environmental innovation has sustainable outcomes.	- Technological innovation in product - Tourism innovation Sustainability
Polat (2015)	Technical innovation helps sustainable transport in cruise tourism.	- Tourism innovation - Sustainability
Ali and Andrew (2014)	Technology Innovation in tourism information and communication enabled to lead to sustainable tourism by better understanding of product, monitoring, measuring, evaluating, forecasting trends, developing partnerships, and engaging and supporting stakeholder.	- Tourism innovation - Technology - Sustainability

Zainudin and Tasnim (2020)	Result from both case study illustrated that local adventure tourism businesses have no specific guidelines and risk management models that they should adhere to.	- Nature-based tourism - Sustainability - Safety management

Safety management and visitors' experience are counted as the primary factor to design and install the technologies which can be innovation in nature-based tourism (Hansen, Hjalager, et al., 2019). However, the relationship between technology in tourism innovation and sustainability in the context of nature-based tourism is still largely lack of researches (Knowles, 2019).

Sustainable management is a vital aspect in tourism industry to the future development. Presently, the definition of sustainable management exists as, tourism keeping the demands of visitors, industries, the environment, and the host areas by a view of the impact on the future economy, society and the environment (UNWTO, 2012). In sustainable management, there are three dimensions such as social, economic, and environmental sustainability. To implement sustainable tourism management, these dimensions need to be equally focused and managing these factors are essential, participation of stakeholders, strong restriction by the government, coherent data analysis (UNEP and UNWTO, 2005). Tourism sustainability depends on planning and management strategies implemented within localized social, ecological, and economic contexts.

UNWTO(2005) stated that alongside with significant development of tourism involved various industry, sustainable management to reduce crucial negative impact on any related aspects. Sustainability principles refer to three dimensions such as

environmental, economic, and social aspects of tourism development, and has become a main driver to accomplish economic prosper while maintaining social, cultural, and environmental sustainable (Edgell Sr, 2016).

Appearance of sustainable tourism management concept by UNWTO (2005) allowed to obtain various sustainable impacts in more details. Sustainable tourism development needs to be well managed and carefully implemented in various aspects in order to ensure the benefit. However, besides its rapid growth of importance in sustainable tourism management, sustainable tourism is still not fully explored and because its concept has been widely proposed, directions for its practical application remains unclear (Waligo, Clarke, & Hawkins, 2013).

Additionally, although there is a strong relationship between AT and sustainable management conceptually, Hunt and Harbor (2019) insisted that AT is not innately sustainable same as other tourism sectors, and its sustainability is highly varied by destination and operation, while it commoditizes nature and culture with its growth and travel related emissions.

Ministry of Land, Infrastructure, Transport and Tourism of Japan announced the importance of sustainable tourism management and the lack of the research with Japanese cases (Ministry of Land, 2019). In Japan, based on the significant growth in inbound tourists, the government is trying to develop tourism industry more for international tourists.

In the report of Ministry of Land, Infrastructure, Transport and Tourism of Japan (2019), the sustainable management by each organization was measured by indicators from a guidebook published by UNWTO (2004) and reported problems of Japanese cases were categorized in each sustainable tourism management aspects. As

the summary of the report, table 3 was announced to have less than 40% effort in Japanese sustainable tourism management comparing to the number of problems.

While many cases of problems have been reported, there are relatively few measures taken from the view of “Wellbeing of Host Communities.” In the future, as the number of foreign tourists visiting Japan increases further, when considering tourism measures, it is also necessary to consider the satisfaction of the accepting tourism in the local community, such as the satisfaction of people living in the region (Ministry of Land, 2019). Also, there are relatively few measures related to "tourism seasonality," "leakage," "number and quality of employment in the tourism sector," and "changes in the cost of living." However, according to the result of the analysis, “health and safety,” “protection of valuable natural assets,” “limiting environmental impacts of tourism activity,” and, “destination planning and control” are considered to be managed by the other department plans.

Table 2 List of insufficient effort items

Classification	Items	
Wellbeing of Host Communities	Level of community satisfaction	
	Effects of Tourism on Communities	Social benefits associated with tourism
	Access by Local Residents to Key Assets	
Health and Safety*	Tourist Security	
Capturing Economic Benefits from Tourism	Tourism Seasonality	
	Leakages	
	Employment	Number and quality of employment in tourism sector
	Community and destination Economic Benefits	Business investment in tourism/ Community expenditures
		Changes in cost of living
Protection of Valuable Natural Assets*	Protecting Critical Ecosystems	
Limiting Environmental Impacts of Tourism Activity*	Solid Waste Management	
	Controlling Noise Levels	
Destination Planning and Control*	Air Transport	

Items that are considered to be addressed by other departments.

Source: Ministry of Land (2019)

The government pointed out the lack of management perspective and its needs for the future development. As Japan also announced, alongside with the increasing demand and future trend on NBT towards inbound tourists, the study on NBT development towards sustainable future is expected to be highly beneficial.

Based on the given problems by Ministry of Land, Infrastructure, Transport and Tourism of Japan in 2019 and the current trend and state on NBT development, this research generally aims at finding the impact in sustainable management with Japanese NBT cases. Apart from its rapid rising demand and important role of NBT in sustainable management, it is still a niche tourism sector which seeks for empirical study to develop (Pröbstl & Haider, 2013; Sand & Gross, 2019).

NBT has high possibility in enhancement of sustainability and the management perspective which can contribute to the development towards a sustainable management. However, according to Hunt and Harbor (2019), NBT is not originally sustainable. To cope with the development in sustainability, innovation is an increasingly significant factor in the sustainable tourism business and destinations (Alsos et al., 2014). In the context of NBT, Hansen, Hjalager, et al. (2019) stated that innovation such as installing new technology helps ensuring more safety for participants and enhancing their experience can result as sustainability. Although, there exists cases technologically modified NBT activities, the possibility for sustainability is not yet studied in the literature. Thus, this research can contribute to the lack of empirical study in NBT and sustainable management using technological innovation implemented NBT cases in Japan towards development of growth in tourism industry in Japan. Furthermore, innovative concept with new theoretical

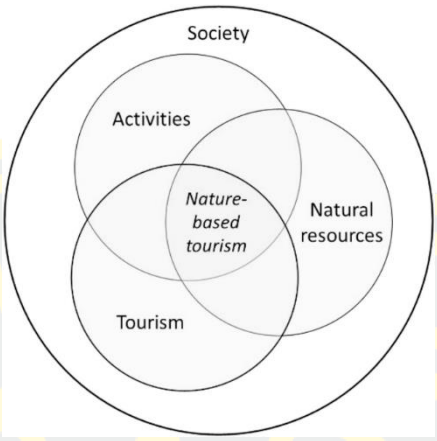
applications through management approaches are highly requested by previous researches.(Pröbstl & Haider, 2013)

Nature-based Tourism (NBT)

Natural phenomena and activities in nature are growing up rapidly and becoming popular market segment in tourism section (Sand & Gross, 2019). Tourism which provides tourists experience by the outdoor activity in nature is called nature-based tourism (NBT) and it has significant global growth as providing outdoor recreation opportunities and has become increasingly popular (Taylor, Varley, & Johnston, 2013). Currently, the definition of NBT exists as “Tourism includes people’s activities when they visit natural areas outside of their usual surroundings.” (Fossgard & Fredman, 2019). Three main components of NBT are activity, natural resource, and tourism. (Figure 8) This definition is widely used to define any tourism built on the natural resources with activity in rural areas not limited by the characteristic of the activity including adventure tourism which measures quality of activity by the level of risk and danger or required skill.

In Japan, the popularity of NBT is significantly growing up as a trend. The government announced its significant growth in demand of the inbound tourists and domestic tourists. The government is promoting NBT since NBT is strongly related to sustainable tourism management since natural resources are one of the essential characteristics in NBT and it impacts on not only environmentally but also local economically. Besides, providing high economic returns and a high-quality visitor’s experience leads to protecting the natural environment and improving the quality of life in community as sustainability (Pérez et al., 2013).

Figure 12. A nature-based tourism framework

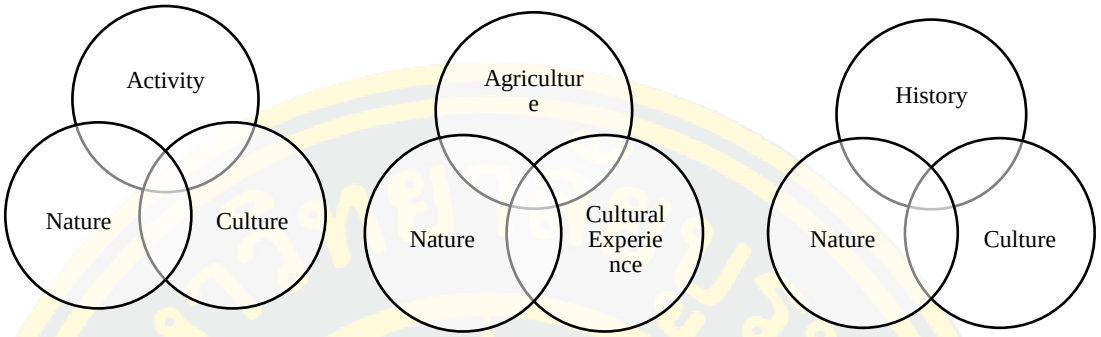


Source: Fossgard and Stensland (2013) cited in Fossgard and Fredman (2019)

As peoples' interests in NBT is growing up currently (Smith-Christensen, 2009), it has significant global growth as outdoor recreation opportunities and become increasingly popular (Taylor et al., 2013). NBT is a niche tourism sector (Novelli, 2005) and its definition is still explored (Sand & Gross, 2019).

In early definition by Buckley, NBT with outdoor activities has links closely to physical activity, contact with nature, other culture and journey (Buckley, 2009) counted as one of the sector in NBT and also called adventure tourism. (Fossgard & Fredman, 2019). As component in NBT, adventure tourism, eco-tourism and green tourism have similarities in the concept such as nature and culture, and adventure tourism is to experience culture in an area and nature through activity. NBT's object is to achieve is contribution to the reginal growth, reformation and economic. While, eco-tourism is aimed at consevation of the nature and sustainability of local distination. Green tourism focuses on the vocational experience in the nature and culture. (Figure13)

Figure 13 Concept for Adventure Tourism, Eco Tourism and Green Tourism



Adventure Tourism Eco Tourism Green Tourism

Source: UNWTO (2014)

In order to establish an overall definition, NBT can be associated with any tourism activities related to the natural resources with outdoor activities.

In the scale of the risk, NBT activities can be categorized as soft adventure and hard adventure. Soft adventure product that would involve very low risk and may be undertaken by anybody physically fit and able, yet they would not necessarily need to have any previous experience. Motivation for this would be more to the experience rather than the expectation of an encounter with any risk(Taylor et al., 2013). Hard adventure product would require previous experience, recognized levels of competence, ability to cope with the unexpected and skills associated with. This might imply some sense of risk seeking(Taylor et al., 2013). For instance, “Hard Adventure” can be bungee jumping, heli-skiing, or white water rafting, “Soft Adventure” is hiking, mountain biking or stand-up peddling(Swarbrooke, Beard, Leckie, & Pomfret, 2003).

The organization has to find out beneficial innovation with the current trend. Hansen, Hjalager, et al. (2019) stated innovation in NBT with outdoor activities is in improvement in visitor's experience and the management of risk and merge with sustainability. Hansen, Hjalager, et al. (2019) also insisted to improve the experience and safety, changes in operation and a new technology can advance innovation in NBT.

In terms of business, it is commonly recognized its many risks differs as a physical safety, a financial risk, an operational risk. They are considered to be a threat that can impact negatively in the field of business, however, succeeding to manage the risk appropriately can bring the business positive impact. (Tohãnean et al., 2020) In tourism industry, tourism business also has risk management aspect to achieve vital goals in the protection of assets, to minimize legal and financial liabilities, to control potential loss, properly manage growth, and to operate responsibility (Silvers, 2005).

In the context of NBT with outdoor activities, risk is one of the crucial aspect to define its characteristic.(Bichler & Peters, 2020; Buckley, 2009; Clinch & Filimonau, 2017; Hansen, Hjalager, et al., 2019; Hansen, Rogers, et al., 2019; Swarbrooke et al., 2003) NBT product with outdoor activities can be defined by two categories depending on the perceived level of risk named as soft or hard adventure product.(Bichler & Peters, 2020; Buckley, 2009; Clinch & Filimonau, 2017; Novelli, 2005; Swarbrooke et al., 2003) Soft adventure product where risk is reduced, are getting popular and more attention from customers than hard adventure products currently(ATTA, 2018). To define hard or soft adventure, Swarbrooke et al. (2003) introduced that experience based on the activity differs in the different level of risk of

an activity in the first definition. Hard adventure has a high-risk activity associated with nature. Whereas soft adventure doesn't need any specialized skill to engage with the activities, hard adventure needs training from instructors before the activity (Buckley, 2009; Swarbrooke et al., 2003) (Table3). McKay (2013) stated that risk management in adventure tourism can be suggested as approaches by safety regulation, staff, and equipment. Failure in safety management leads to issues such as injury and accidents, incompetent staff, poor safety standard, licensed and unlicensed operators, legal regulation, un-standardized operating procedures, and inadequate consumer protection. (Zainudin & Tasnim 2020, Japan Tourism Agency, 2019)

Table 3 Soft Adventure Product and Hard Adventure Product

Soft Adventure Product	Not required specialized skill
	e.g. hiking, mountain biking, stand-up peddling
Hard Adventure Product	Needs training from instructors
	e.g. bungee jumping, heli-skiing, white water rafting,

Source: Buckley (2009), Swarbrooke et al., (2003)

Risk management in perspective of safety for participants of adventure tourism is essential and critical factor for sustainability. (Japan Tourism Agency, 2019) Safety in adventure tourism brings a significant issue which affects the existence of the business and the organization involved in all areas of adventure tourism including stakeholders.

Hansen, Hjalager, et al. (2019) stated that managing participants' safety and fake perceived risk as illusion by technology can maintain participants' demand of excitement and thrill with better safety quality.

Moreover, appearance of new demand by elderly accelerates the need for low-level physical activity and leads to the challenge in NBT (Pröbstl & Haider, 2013). Hence, managing safety to reduce the risk in outdoor activities and understanding a way of the management by operators is essential for the sustainable future to develop NBT industry. NBT with outdoor activities is still one of niche tourism sector which lacks in empirical studies and theories. These problems highlight the need of this research more clearly for the relationship between technology, NBT and sustainable management.

Nature-based Tourism (NBT) trend in Japan

Japan's population peaked in 2008 and is entering a society with a declining population. (Japan Tourism Agency, 2019) As there are concerns about depopulation due to population outflows and the resulting acceleration of the impact on industries, it is essential for the development in local economy by creating industries and jobs. (Japan Tourism Agency, 2019) It is expected that the need for "local consumption" to go around the local area and enjoy the experience unique to the area is expected to increase in Japan.

Under such a background, in 2018, the influx of foreign tourists to Japan exceeded 30 million for the first time, it is expected to continue to grow steadily in the future. (Japan Tourism Agency, 2018,Oie (2009)) In addition, tourists who have been visiting urban areas in Japan is growing. (Japan Tourism Agency, 2018) Japan has abundant and diverse natural resources through all over Japan. Expanding the exchanged population and lead to the circulation of the local economy by promoting tourism to Japan through excavation and utilization is highly recommended by the

national tourism department. (Japan Tourism Agency, 2019)

In Japan, NBT market is expected to grow to approximately $444.8 billion to approximately $1,335.7 billion in 2016-2023 and, moreover, the average consumption of adventure tourism travelers per trip is about $3,000 (330,000 yen), more than double the average consumption of foreign tourists visiting Japan of 154,000 yen (UNWTO, 2014; Japan Tourism Agency, 2019).

Japan is rich in natural resources to provide adventurous content derived from nature. (Jones, 2009) Natural resources are unique in Japan compared to other countries, such as many mountains, volcanoes, rivers, lakes, seas, national parks, with a wealth of nature reserves and thus the potential to become an attractive tourist resource is highly expected (Japan Tourism Agency, 2019). The questionnaire conducted for 20 nationals and regions in 2018 by Japan Tourism Agency (Figure 2) towards international tourists conducted by the government also supports that there is a clear trend and growth market for adventure activities in tourism context (marked as green in Figure 2) and shows “experiences derived from nature" was observed in significant portion.

Japan has a great potential in nature experience-based tourism as a strength and has great potential to develop the national tourism industry. Japan Tourism Agency (2019) assumed that many of the content in adventure tourism that has developed overseas will be available in Japan in the future in order to bring foreign visitors to Japan with experiences and enjoyment unique to the area. Not only from the perspective of product development and sales, but also it is crucial to support how to nurture businesses that develop tourism, and how to build the experience content with high-quality collaborative relationships in nature and experience to attract

foreign travelers, or to obtain foreign currency through tourism while foreign tourists visiting Japan (Japan Tourism Agency, 2019). The idea of maintaining the value of the local natural environment and tourism resources while earning profit is related to sustainability.

Japan Tourism Agency (2019) also has stated that, to lead NBT to earn sustainability, factors to achieve sustainable growth in safety, ensuring quality, and conserving environmental and tourism resources are essential. Especially, ensuring safety of participants is extremely vital comparing to other factors such as mortgage of quality, conservation of nature and environment.

Conceptual Framework and Hypothesizes

T-O-E framework

Technology-Organization-Environment (T-O-E) theory is one of the innovation theories which is common to identify the factors which effect to adopt new technology to the services or products in organization level established by Tornatzky and Fleischer (1990, as cited in Oliveira & Martins, 2011). Currently, in AR technology adoption, it has been studied with individual adoption theory in the context of tourism (Loureiro, Guerreiro, & Ali, 2020). However, in the previous cases, the SAR technology was adopted by the organization and it is not for the individual uses. Therefore, this study uses T-O-E theory framework to address technology adoption in organization level.

Based on the theory, there are three dimensions in adoption of the technology; technological context, organization context, and environmental context by the organization. Since T-O-E theory is not addressed in SAR technology within tourism

industry yet, this study uses the common factors in the theory built by the context of NBT. However, some adoption factors can be adjusted in different TOE context since TOE 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 product and SAR, and thereby offer industry-specific and technology-specific insights. Each of these dimensions is discussed in below.

Technological context

Technological context refers to "Systems design perspective."(Tornatzky & Klein, 1982) The combination of T-O-E framework and diffusion of innovation (DOI) theory as technological factors theory is widely used to measure the adaptation of technology (Chiu, Chen, & Chen, 2017). The technological factors of technology adoption in DOI theory are relative advantage, compatibility, complexity, trialability and observability.

Relative advantage, in the context of AT, refers to enhancement in visitor's experience and reducing danger of the activity as innovation and adopting the technology is expected to positively impact on these factors (Hansen, Hjalager, et al., 2019).

Compatibility is to measure innovation as consistent with the existing values (Tornatzky & Klein, 1982) In the context of AT, the integration with the existing value of product can follow the characteristic of AT product such as natural resource, culture, and activity(ATTA, 2018). Compatibility impacts positively in general studies to adopt the technological innovation by the organization(Chiu et al., 2017).

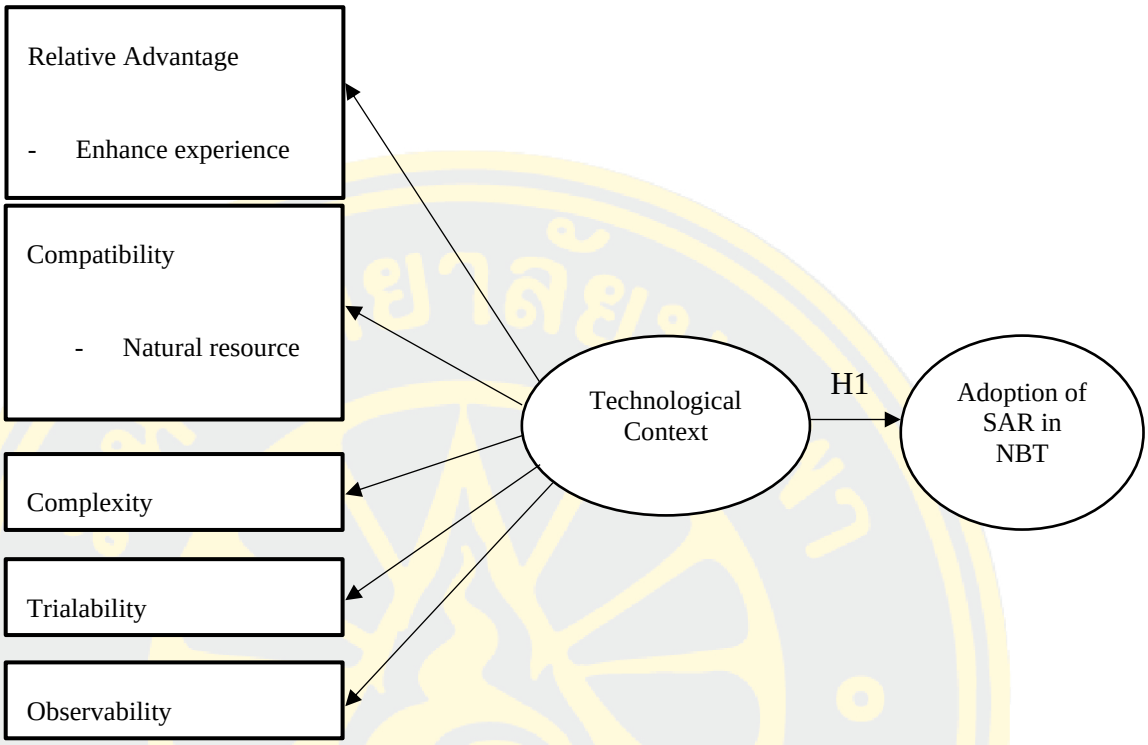
The new technology tends to have complexity in the usage, and previous researches addresses its negative impact on adaptation of the technology.(Lin, 2014)

Trialability is the degree of examining new innovative technology before actually adopting to it (Tahir 2015). In organizational context, what the organization perceived from implementation experience by other organizations before its actual implication to reduce uncertainty in the outcome of the adoption can be the factor to affect the adoption. In this case, the economic performance and tourism growth were announced by TEA as the first implementation and Nagasaki city had certain expectation towards it.

Observability refers to if the innovation is visible to the others(Tornatzky & Klein, 1982). As SAR characteristic, it shows projected augmented reality in the real environment to the participants, it is obvious for the people that SAR is implemented or not. The level of observability is considered to attract people more. (Tornatzky & Klein, 1982)

H1: Technological context effects adoption of SAR in NBT.

Figure 14 Conceptual framework in technological context

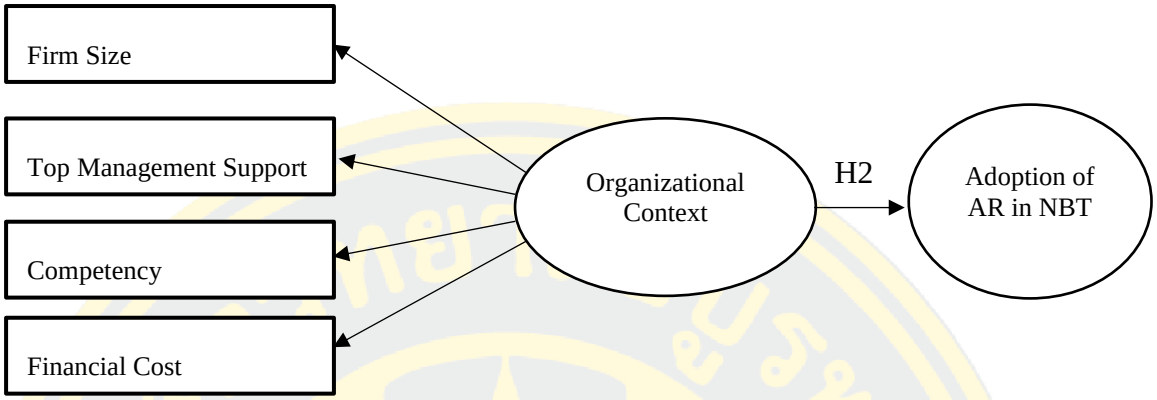


Organizational context

Organizational context describes a characteristic of the organization and internal factors that impacts on the adaptation of the technology. Ratten and Braga (2019) addressed that the decision of innovation depends on the firm size and the knowledge of top management executives and their attitude towards innovation also impacts positively on the adaptation of the new technology in the tourism organization. The competency of the organization towards the new technology is also observed as positive effect (Lin, 2014). Higher knowledge of employees about the technology, more adaptation of the technological innovation resulted. However, adopting new technology is normally addressed as costly and it also effects the adoption (Hansen, Hjalager, et al., 2019; Ratten & Braga, 2019; Tornatzky & Klein, 1982). Therefore, hypothesizes for organizational context are posed as following.

H2: Organizational context effects adoption of SAR technology in NBT.

Figure 15 Conceptual framework in organizational context



Environmental context

Environmental context is the external factors that can affect the adoption of the innovation(Angeles, 2013). Tourism innovation aims at gaining the competitive advantage and the trend in NBT stimulate the implementation of the innovation on NBT product as the external factors. (Hansen, Hjalager, et al., 2019)Therefore, competitive pressure is assumed to be an essential factor. In Japan, since expectation in sustainable tourism management was announced by the government, the pressure for sustainable management by the government also exists as the external influence. Additionally, the government provides policies to support tourism businesses. Not only from the government, business alliance as partnership to support the adaptation of the technological innovation exists as an external factor.(Ratten & Braga, 2019; Wang, Li, Li, & Zhang, 2016) Therefore, government and external support can be another positive external factor to influence the adoption.

H3: Environmental context effects adoption of SAR technology in NBT.

Figure 16. Conceptual framework in Environmental context

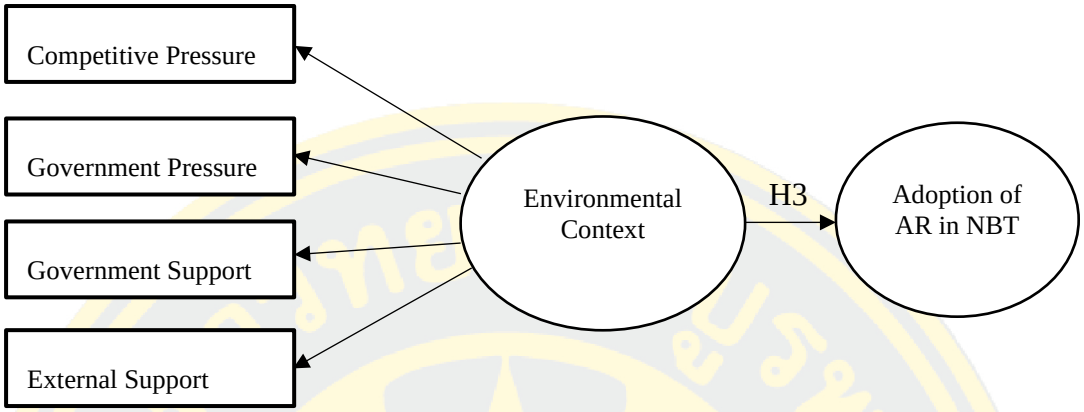


Table 4 Definitions of Factors in T-O-E Framework

Context	Factor	Definition	Reference
Technological	Relative Advantage	"The degree to which an innovation is perceived as being better than the idea it supersedes." (Tornatzky & Klein, 1982)	Hjalager (2015) Lin (2014) Chiu et al. (2017) Ratten and Braga (2019) Ghobakhloo, Arias-Aranda, and Benitez-Amado (2011) Wang et al. (2016)
	Compatibility	"The degree to which an innovation is perceived as being consistent with existing values, past experience, and needs of the receivers." (Tornatzky & Klein, 1982)	Lin (2014) Chiu et al. (2017) Ghobakhloo et al. (2011) Wang et al. (2016)
	Complexity	"The degree to which an innovation is perceived as relatively difficult to understand and use." (Tornatzky & Klein, 1982)	Lin (2014) Chiu et al. (2017) Wang et al. (2016)
	Trialability	"The degree of examining or testing a new innovation before actually adopting to it." (Tahir, 2015)	Angeles (2013) Chiu et al. (2017)

	Observability	"The degree to which the results of an innovation are visible to others." (Tornatzky & Klein, 1982)	Chiu et al. (2017)
Organizational	Firm size	The level of capital and revenue within the industry, the number of employees (Lin, 2014)	Lin (2014) Ratten and Braga (2019) Ghobakhloo et al. (2011) Wang et al. (2016)
	Top Management Support	The level of top management support towards the adoption. (Lin, 2014)	Lin (2014) Angeles (2013) Chiu et al. (2017) Ratten and Braga (2019) Ghobakhloo et al. (2011) Wang et al. (2016)
	Competency	The level of employees' capability and capacity of the new technology. (Lin, 2014)	Chiu et al. (2017) Lin (2014) Wang et al. (2016)
	Financial cost	The perceived financial cost to adopt the new technology (Tornatzky & Klein, 1982)	Soames, Brunker, & Talgaswatta, 2011 cited in Hansen, Hjalager, et, al., 2019 Ratten and Braga (2019) Ghobakhloo et al. (2011)
Environmental	Competitive Pressure	The level of pressure from competitors in the same industry. (Lin, 2014)	Lin (2014) Chiu et al. (2017) Ghobakhloo et al. (2011) Wang et al. (2016)

	Government Pressure	The level of pressure from the government announcement.	Angeles (2013)
	Government Support	Government policy, measures, or incentives.	Chiu et al. (2017)
	External Support	Supports from business partners, relative associations.	Hansen, Hjalager, et, al., 2019 Chiu et al. (2017) Ratten and Braga (2019) Ghobakhloo et al. (2011)

Table 5. Factors found in previous studies

Technology	**Source**	**Technological**					**Organizational**				**Environmental**			
		RA	CPA	CPL	T	O	FS	TMS	C	FC	CP	GP	GS	ES
Broadband mobile applications	Chiu et al. (2017)	X	X	X	X	X		X	X		X		X	X
E-SCM	Lin (2014)	X					X	X	X	X	X			X
RFID	Angeles (2013)				X			X				X		
Mobile hotel reservation systems	Wang et al. (2016)	X	X	X			X	X	X		X			
E-Commerce	Ghobakhloo et al. (2011)		X				X	X		X	X			X
EPs	Harley et al. (2020)	X	X	X			X	X	X		X	X	X	X
Cyber security	Hasan et al (2021)							X	X			X	X	X
Smart farm	Yoon et al. (2020)	X	X	X				X	X	X	X	X		
SaaS	Oliveira, et al. (2019)		X					X			X	X		
CRM	Cruz-Jesus et al. (2019)		X					X			X			

Fleet safety management	Yusuf Mohamed & Osden Jokonya (2021)	X	X	X	X		X	X	X		X			X
Smart Contracts and Internet of Things	Gregor Schmitt et al.(2019)	X	X				X		X		X	X		
National Disaster Management	AlHinai (2020)	X	X				X		X		X	X		X
None	Ratten and Braga (2019)	X					X	X		X				X
Smart Belay	Hansen, Hjalager, et, al., (2019)	X								X				X
Frequency		10	10	5	3	1	8	12	9	5	11	7	3	9

Note: RA= Relative Advantage, CPA= Compatibility, CPL= Complexity, T= Trialability, O= Observability, FS= Firm size, TMS= Top Management Support, C= Competence, FC= Financial cost, CP= Competitive pressure, GP=Government pressure, GS= Government support, ES= External support

Technological Innovation and Sustainable Tourism Management

Tourism industry has been the first application platform for new technological innovation which generate new markets and products and it has complementally relationship between technology and sustainability (Ratten & Braga, 2019). Although the relationship of technological innovation and sustainable management has been insisted in many previous researches (Table7), it is only addressed in a broad sense of the term “innovation” and sustainability towards “sustainable management.” Fossgard and Fredman (2019) stated that the current issue in AT is also how product innovation

can occur. Therefore, it is still largely lack of the significant evidence to prove its complementally relationship.

Considering the case of SAR as an innovative technology, Bec et al. (2021) noted that SAR is an innovative digital technology and can expect in the outcome of sustainable management with high-level visitor's experience.

Table 6 Related Relationships

Relationship	References
Technological Tourism Innovation and Sustainable Tourism Management	Hansen, Hjalager, et al. (2019) Ratten and Braga (2019) Rodríguez et al. (2014) Ali and Andrew (2014) Moscardo (2008) Polat (2015) Dibra (2015) Genc (2020) Pröbstl and Haider (2013)
Nature-based tourism and Sustainable Tourism Management	Hansen, Rogers, et al. (2019) Hansen, Hjalager, et al. (2019) Zainudin and Tasnim (2020) Knowles (2019) Pérez et al. (2013)

As other tourism sectors, adventure tourism is not innately sustainable (Hunt & Harbor, 2019), however, the expectation of NBT is often addressed in sustainability and that leads to the discussion of the importance in sustainable management. (Table 7) Since the natural resource is essentially related to NBT, it is often addressed in environmental protection issues. However, it is a major issue in tourism that the difficulty to balance economic benefits and environmental preservation due to the

nature of tourism. Knowles (2019) insisted that although there are conceptual links in NBT and sustainable tourism theory, it is still not addressed in the way to deal with sustainable issues.

In order to manage sustainability, there are three dimensions such as social, economic, and environmental to be equally focused and managed (UNEP and UNWTO, 2005)(Table 8). Meanwhile, challenges in NBT were addressed in the same aspects; social, political and economic and environmental such as avoidance of environmental impact, open access for elderly (providing easy activities) and well-thoughts for rural area where facing depopulation, lack of social services and jobs(Pröbstl & Haider, 2013). These challenges results in sustainability and thus it emphasizes the importance of sustainable management in three aspects in NBT context.

Under these circumstances, the appearance of SAR adopted soft adventure product was observed as a new attraction in Japan. Since Japanese government announced the problems in sustainable tourism management, this study specifies the technology, SAR, as an innovation and seeks the possibility if the SAR innovation to be the solutions for those issues. Therefore, this research aims to reveal the relationship between innovation by SAR in soft adventure product and sustainable management towards each dimension.

H4: Adoption of SAR effects sustainable tourism management.

Figure 17. Conceptual Framework in sustainable management

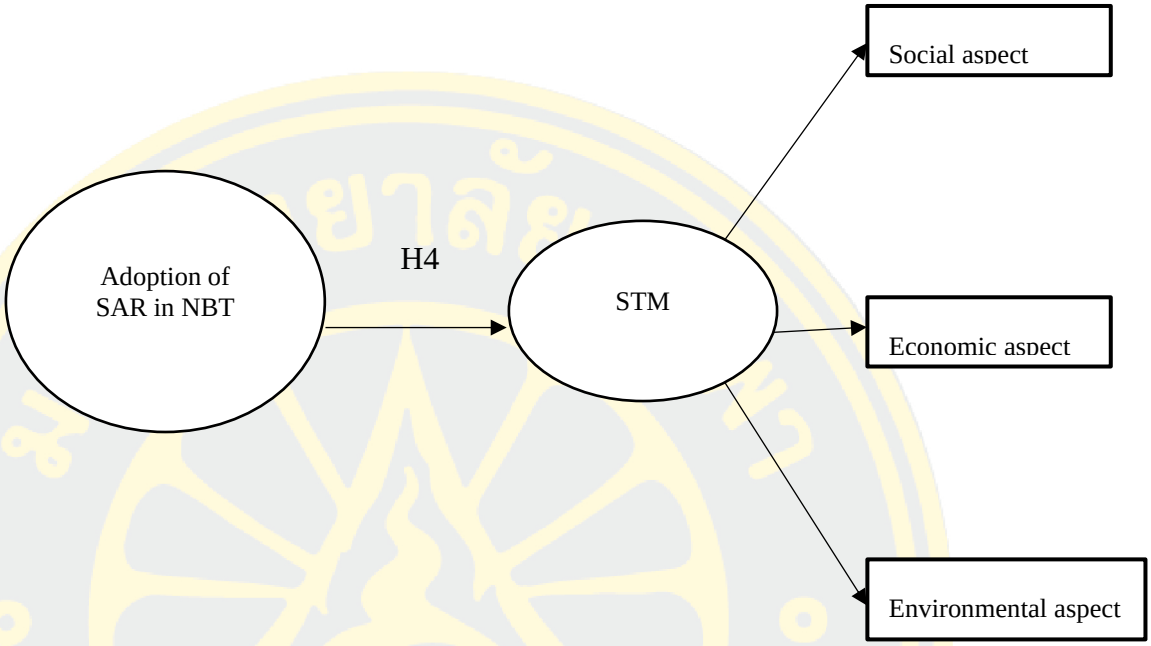


Table 7 Definition of Sustainable Tourism Management

Aspect	Definition	Problems in Japan
Social	"Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance."(UNEP and UNWTO, 2005)	1) Wellbeing of Host Communities - Level of community satisfaction - Effects of Tourism on Communities - Access by Local Residents to Key Assets 2) Health and Safety - Tourist security
Economic	"Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable	1) Capturing Economic Benefits from Tourism - Tourism seasonality - Leakages

	employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation." (UNEP and UNWTO, 2005)	- Employment - Community and destination economic benefits
Environmental	"Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity." (UNEP and UNWTO, 2005)	1) Protection of Valuable Natural Assets - Protecting critical ecosystem 2) Limiting Environmental Impacts of Tourism Activity - Solid waste management - Controlling Noise level 3) Destination Planning and Control - Air transport

Conceptual framework of the study

T-O-E framework is adopted to know what factors effecting to the adoption of SAR in NBT context. Additionally, this study aims to see the relationship between technological innovation and sustainable tourism management towards each aspect in the case of SAR in nature-based product in Japan as the government announcement. Thus, the conceptual framework of this research was designed as following (Figure19).

Figure 18 Conceptual framework of the study

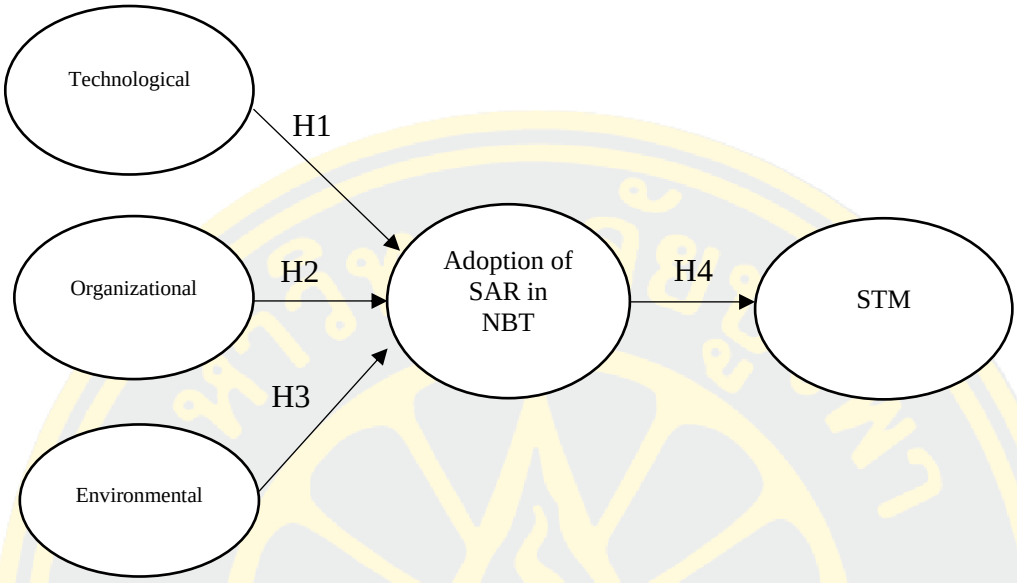


Table 8 Summary of hypotheses

H1	Technological context effects adoption of SAR in NBT.
H2	Organizational context effects adoption of SAR in NBT.
H3	Environmental context effects adoption of SAR in NBT.
H4	Adoption of SAR effects sustainable tourism management.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter explains the method used by researcher to conduct this research. The research is aiming at identifying factors affecting in adaptation of spatial augmented reality installed in nature-based tourism and the relationship with sustainable tourism management. The study is a confirmatory study which quantitative method approach.

This chapter covers the following sections:

- Research design
- Research instrument
- Data collection source
- Method of data analysis.

By reading this chapter, the readers are expected to be able to understand the research design to answer the research questions and research objectives. Method of data collection will help readers to embody this research in more concrete understanding. In the end of this chapter, proposed analysis steps as a summary of the overall methodology is showed to continue to Chapter 4.

Research design

The quantitative method is used in this research to obtain concrete evidence with numerical data. While qualitative research method has been recognized as the appropriate method for nature-based tourism such as adventure tourism and significant to describe the 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.

Nature-based tourism is divided into several niche tourism sectors with the field that has been developing and the challenges of studies require the determination of components (Sand & Gross, 2019), furthermore, there is no previous study about SAR products implemented in NBT. Therefore, the empirical research with quantitative analysis will be implemented with the case to identify the factors affecting adoption of SAR and the relationship with sustainable tourism management by the case in Japan.

In quantitative method, the researcher would distribute the questionnaire to the respondents who are chosen from the stakeholders that have rich knowledge of the management in nature-based tourism products and SAR such as long-term employees, CEOs, managers, organizers and governors. The questions will be formed by the proposed hypotheses and the factors in T-O-E framework by using a Five-point Likert Scale.

Population and sample size

This research aims at finding the factors affecting digital technology such as SAR onto nature-based tourism and the relationship with sustainable tourism management to contribute to the government requirement of management perspective in sustainable tourism management (Ministry of Land, 2019). Therefore, the target population for this research is the stakeholders that have rich knowledge in 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 the purposeful sampling are 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.

For the sample size, since population is undefined, commonly, more than 200 is needed (Boomsma, 1987). Also, Schumacker and Lomax (2004) stated to analyze the qualitative data by Sampling Equation Modeling, a sample size has to be determined by given power, effect size, and alpha.

Therefore, to determine the sample size, this research employs Cochran (1963:75) formula which is common to use for the undenied population as following.

$$n_0 = \frac{Z^2pq}{e^2}$$

where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails (1 - α equals the desired confidence level, e.g., 95%)1, e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve.

In this study, the appropriate sample size was obtained by using

n = sample size

Z = confident level, 95% = 1.96 (according to standard Z score table)

e = level of precision, 5% = 0.05

q = 1 – p = 1 – 0.5 = 0.5

$$n_0 = \frac{Z^2pq}{e^2},$$

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2},$$

$$n_0 = \frac{0.96}{0.0025},$$

$$n_0 = 384$$

Therefore, sample size for this research is 384. To avoid the errors, increased sample size to 400 is employed in this research.

Research Instrument

Questionnaire

The quantitative data was collected by the questionnaire designed by the researcher distributed by on-line tools such as Google form. The questionnaire is divided in three parts, namely Part 1 and 2 added 2 more parts in Part 2 namely Part2-1, 2-2. Part 1 consists general information such as position, SAR experience, and willingness to use SAR in the future. According to the result of COI, 5 questions are added by the committee, thus total number of the questions are 63. The questions were translated in Japanese by the researcher and built by Five-point Likert Scale with the range of 5 “Strongly agree” to 1 “Strongly disagree.”

5- Strongly agree

4- agree

3- Moderate

2- disagree

1-Strongly disagree

Table 9 The questionnaire structure

Scale	Number of questions	Items number
Part 1: General information	3	1 to 3
1. Position	1	1
2. SAR experience **Has your organization ever installed SAR in nature-based tourism?**	1	2
3. Is your organization interested in installing SAR in nature-based tourism product in the future?	1	3
Part 2-1: Questions about installing SAR in the product	43	1 to 43
Technological context	10	1 to 10
Relative advantage	4	1 to 4
Compatibility	3	5 to 7
Complexity	3	8 to 10
Organizational context	12	11 to 22
Firm size	3	11 to 13
Top management support	3	14 to 16
Competence	3	17 to 20
Financial cost	3	21 to 22
Environmental context	9	23 to 31
Competitive pressure	3	23 to 25
Government pressure	3	26 to 28
External support	3	29 to 31
Adoption of SAR in NBT product	15	32 to 47
Visitor's experience	6	32 to 37
Safety	3	38 to 40
Nature preservation	3	41 to 43
Profitability	4	44 to 47
Part 2-2: Questions about STM with SAR product	16	48 to 63

Social aspect	6	48 to 53
Economic aspect	6	54 to 59
Environmental aspect	4	60 to 63
Total	**63**	

Part 2-1 to 2-2 are related to the dependent and independent variables. In these parts, the researcher uses five-points Likert-type scale ranging from 1 “strongly disagree” to 5 “strongly agree.” The interpretation of mean score is employed during the data analysis as following the formula below:

The range from each level= (The highest score-The lowest score)/Number of levels

= (5-1)/5

= 0.8

The effectiveness can be interpreted as following level below:

4.21-5.00	Very High
3.41-4.20	High
2.61-3.40	Average
1.81-2.60	Low
1.00-1.80	Very Low

Table 10. 5-point Likert scale summary

Scale	Rank Score	Level of Agreement	Interpretation
5	4.21-5.00	Strongly Agree	Very High
4	3.41-4.20	Agree	High
3	2.61-3.40	Neutral	Average
2	1.82-2.60	Disagree	Low
1	1.00-1.80	Strongly Agree	Very Low

Validity

The validity of each question in questionnaire was measured by three experts who are specialists in tourism field and have knowledge on the topic of this research by using Indexes-Objective Congruence (IOC) which evaluates each question by the score as following.

Congruent= +1

Questionable= 0

Incongruent= -1

Any items with score lower than 0.5 will be revised. If the score is higher than or equal to 0.5, the item will be approved to be in the research instrument followed by the equation below.

$$IOC = \frac{\sum R}{N}$$

IOC= Consistent between the objective and content or questions and objective

ΣR= Total assessment points given from all qualified experts

N= Number of qualified experts

The researcher tested the accuracy of the content (content validity) of the query with 3 experts as bellow. (See Appendix in the end for signatures from experts.)

1. Expert 1: Assit. Prof. Dr. Apinya Ingard
   Deputy Dean of Faculty of Information and Communication Technology, Silpakorn University
2. Expert 2 Asst. Prof. Dr. Petchalas Viriyasuebphong
   Faculty of Management and Tourism, Burapha university
3. Expert 3 Mr. Ryuichi Tani
   Yamagi Wide-area Promotion Bureau, Regional Art Manager (2019-June 2021), Kyoto Art Center, Program Director (July 2021-present)

The researcher has set the Item Objective Congruence (IOC) Index of each item not less than 0.5. refer to summary table of the content validity test of questionnaire in Table1. As the result, all of the questions got the score of 1.0 which can be concluded as “Congruent.” Questions number 37, 47, 49 were added by the suggestion of the expert.

Reliability

After the confirmation of validity of research instruments, the data for the pilot of the questionnaire was collected from 30 samples from the respondents who has the knowledge about SAR, NBT and sustainable tourism management in Japan in order to find out the discriminant index of each item and reliability index based on Cronbach’s

Alpha. The value of Cronbach's Alpha is defined by George and Mallery (2019) as below:

Cronbach's Alpha(α) > .9 = Excellent

Cronbach's Alpha(α) > .8 = Good

Cronbach's Alpha(α) > .7 = Acceptable

Cronbach's Alpha(α) > .6 = Questionable

Cronbach's Alpha(α) > .5 = Poor

Cronbach's Alpha(α) < .5 = Unacceptable

According to George and Mallery (2019), the coefficient Cronbach's Alpha should be equal to greater than 0.7 to ensure the reliability of the research instruments. However, Hair et al.(2019) stated that values of .60 to .70 are still acceptable and the number of items less than 10 can lead to the lower score. As a result, Technological context and Environmental context had below .70 which were questionable with the score .69 and .68, which can be acceptable.

Table 11 Result of Reliability test

Variable	Number of Items	Chronbach's Alpha
Technological context	10	.69
Organizational context	11	.72
Environmental context	9	.68
Adoption of SAR in NBT	15	.84
STM	16	.79
Total	63	.92

Source: Author's complete

Hence, each variable contained acceptable reliability with the range of .68 to 84 and by total 63 questions with each variances and total answer's variances, the result of reliability came out as α= .92 which fits as excellent.

Data Collection Source

Primary Data

The primary data of this research is the data from quantitative method extracted from targeted respondents in Japan.

Firstly, to collect the primary data, the researcher will request the ethical latter admitted by the Ethics committee of Burapha university to conduct the research. After getting the ethical letter, the researcher will start collecting data from the samples in Japan. The research instruments will be online questionnaire by Google form. The researcher sent the e-mail to the respondents attached a link for Google form by the combination of convenience sampling and the purposeful sampling for the data collection. After the respondents fill in the form, the result was sent to the researcher automatically through Google form. The questions were translated in Japanese to ensure the comprehension of respondents. The questionnaire was distributed and collected during October to December in 2021.

Secondary Data

The secondary data is to support the analysis by different data source from primary data such as articles, books, journals, theses, newspapers, E-database of Burapha university library online, and those relevant to the concepts, theories, ideas.

Method of data analysis

The collected quantitative data was examined in statistical program called Statistical Package for Social Science (SPSS). The survey data is analyzed by four different methods such as Descriptive analysis, Normality and Correlation test, and Structural Equation Modelling (SEM).

In Descriptive analysis, the researcher generates 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 normality of data including basic assumption is checked as a next step. the Skewness and Kurtosis values are the indicator index for checking normality data in this method (Hair, Black, & Babin, 2018).

The researcher also examines correlation of following factors TC(Technological context), OC(Organizational context), EC(Environmental context), AR(Augmented Reality), NBT(Nature-based Tourism), STM(Sustainable Tourism Management).

Finally, Structure Equation Modeling Analysis(SEM) is employed to analyze the primary purpose of this study. SEM enables to examine theoretical model with the empirical data by checking whether if it fits with goodness of fit criteria or not. According to Hair(2018), more complex model with larger samples should be less strict than simpler model with smaller samples. In this study, 17 observed variables with 400 samples follows the adjusted model of goodness of fit. (Table 13) 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), Relative Non-centrality Index(RNI), Standardized Root Mean Square Residual(SRMR), and Root Mean Square Error of Approximation(RMSEA).

Table 12 Model of Goodness of Fit

Goodness of fit test	Good fit or accepted levels
Chi-square (X^2)	Significant p-values expected (p>.05)
Goodness-of-fit index (GFI)	0 to 1 (greater .90 is good)
CFI	Above .90
TLI	Above .90
AGFI	Above .80
RMSEA	<.05

Note: m = number of observed variables

Sources: Hair (2018, p.635-642), Baumgartner and Homburg (1996) , Doll, Xia, and Torkzadeh (1994)

CHAPTER 4
DATA ANALYSIS AND RESULT

This chapter explores the obtained data from 402 respondents who has the knowledge of SAR, NBT or tourism and management generally in Japan. The result of questionnaires is coded and analyzed using SPSS program by frequency, percentage, mean, standard deviation values. After analyzing demographic profile, AMOS was used to analyze Structure Equation Modelling(SEM) to achieve the objectives of this study.

The following are the parts of data analysis presented in this chapter:

1. General Information analysis
2. Descriptive statistic and normality of data
3. Confirmatory factor Analysis
4. The result of testing construct validity and hypothesis testing

Symbols using in data analysis:

M= Arithmetic Mean

SD= Standard Deviation

R= Pearson Product Moment Correlation Coefficient

CV= Coefficient of Variation

SK= Skewness

KU= Kurtosis

β= Standardized factor Loading

SE= Standard Error of b

t= t-value

p= p-value

$\boldsymbol{X^2}$ = Chi-square

df= Degree of Freedom

CFI= Comparative Fit Index

SRMR= Standardized Roof Mean Squared Residual

RMSEA= Root Mean Squared Error of Approximation

RNI= Relative Non-centrality Index

GFI= Goodness-of-fit index

AGFI= Adjusted Goodness-of-fit Index

TC= Technological context

RA= Relative Advantage

COMP= Compatibility

CX= Complexity

OC= Organizational context

FS= Firm size

TMS= Top management support

COM= Competence

FC= Financial cost

EC= Environmental context

CP= Competitive pressure

GP= Government pressure

ES= External support

AR= Augmented Reality

NBT= Nature-based Tourism

ARNBT= Adoption of Augmented Reality in Nature-based Tourism

SA= Safety

NP= Nature preservation

PROF= Profitability

NBT = Nature-based Tourism

STM = Sustainable Tourism Management

SA= Social aspect

ECA= Economic aspect

ENA= Environmental aspect

General Information analysis

Table 13. The Result 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			
Has your organization ever installed SAR in nature-based tourism product?	Yes	272	67.66
	No	130	32.34
3. Is your organization interested in installing SAR in nature-based product in the future?	Yes	325	80.85
	No	77	19.15
Total participants		402	100

In this study, there were 402 participants(n=402) who responded the questionnaires online. In this part, general information of the participants was analyzed by frequency and percentage which are shown in Table14.

According to Table 13, the positions of participants were shown as CEO(n=56) was 13.93% in the percentage, Manager(n=68) equals to 16.92%, Organizer(n=52) equals to 12.94%, Governor(n=48) equals to 11.94%, Employee(n=158) equals to 39.30%, Other(n=20) equals to 4.98%. Thus, Employee(n=158, 39.30%) has the most ratio in this section, followed by Manager(n=68, 16.92%), CEO(n=56, 13.93%),

Organizer(n=52, 12.94%), Governor(n=48, 11.94%), and Other(n=20, 4.98%).

Descriptive Statistic and Normality of Data

As the first step of descriptive analysis, Mean (M) and Standard (SD) of each latent variables were analyzed with the level of mean and interpretation for each level. (Table14)

Table 14. Summary of level of each variable in the construct

Variable	M	SD	Level of Agreement	Interpretation
Technological context (TC)	3.48	0.48	Agree	High
Organizational context (OC)	3.52	0.32	Agree	High
Environmental context (EC)	3.75	0.42	Agree	High
Adoption of SAR in NBT(ARNBT)	4.01	0.19	Agree	High
Sustainable Tourism Management (STM)	3.87	0.18	Agree	High

N=402

According to table 14, the values of each factor were the range of 3.48 to 4.01. Adoption of SAR in NBT resulted in the highest mean score as 4.01 while the lowest mean score with Technological context (TC) was 3.48. Sustainable tourism management (STM) was 3.87, Environmental context (EC) was 3.75, and Organizational context was 3.52. Additionally, the agreement levels were ranked in "agree" level with "high" performance.

As the next step, the researcher tested the normality by Skewness (SK), Kurtosis (KU) with Mean(M), Standard Deviation (SD), and Coefficient of Variances (CV) for each observed variable as the second step of the analysis. (Table 16)

Table 15. Descriptive statistics

Latent Variables	Observed Variables	Indicators	M	SD	CV(%)	SK	KU
Technological Context	Relative Advantage	RA1	4.41	0.75	17.00	-1.36	2.25
		RA2	3.73	0.91	24.42	-0.28	-0.27
		RA3	4.18	0.82	19.66	-0.83	0.32
		RA4	3.95	0.96	24.31	-0.79	0.29
	Compatibility	COMP1	4.17	0.90	21.64	-0.99	0.73

		COMP2	4.26	0.75	17.66	-0.85	0.86
		COMP3	4.13	0.82	19.73	-0.86	1.01
	Complexity	CX1	3.10	1.25	40.30	-0.05	-1.02
		CX2	3.21	1.24	38.52	-0.15	-1.01
		CX3	3.31	1.20	36.14	-0.28	-0.87
Organizational Context	Firm Size	FS1	3.13	1.15	36.64	-0.38	-0.54
		FS2	3.21	1.18	36.78	-0.36	-0.58
		FS3	3.02	1.27	42.08	-0.09	-0.96
	Top Management Support	TMS1	3.85	1.21	31.38	-1.05	0.22
		TMS2	3.81	1.28	33.69	-0.93	-0.23
		TMS3	3.65	1.26	34.4	-0.81	-

					9		0.26
	Competence	COM1	3.39	1.32	38.95	-0.43	-1.01
		COM2	3.54	1.35	38.14	-0.65	-0.81
		COM3	3.21	1.06	33.10	-0.17	-0.61
	Financial Cost	FC1	4.00	0.88	22.15	-0.75	0.49
		FC2	3.63	1.12	30.82	-0.66	-0.21
		FC3	3.76	0.95	25.37	-0.34	-0.37
Environmental Context	Competitive Pressure	CP1	3.96	0.99	25.07	-0.75	0.00
		CP2	3.46	1.22	35.45	-0.42	-0.90
		CP3	4.24	0.88	20.77	-1.14	1.20
	Government Pressure	GP1	3.65	1.20	32.74	-0.63	-0.47

		GP2	3.55	1.15	32.46	-0.69	-0.15
		GP3	3.65	1.21	33.03	-0.69	-0.32
	External Support	ES1	2.93	1.20	40.91	0.00	-0.97
		ES2	4.13	0.85	20.55	-0.76	0.21
		ES3	4.19	0.87	20.79	-1.07	1.14
Adoption of AR in NBT	Visitor's Experience	VE1	4.33	0.78	17.90	-1.11	1.25
		VE2	4.33	0.79	18.34	-1.05	0.85
		VE3	4.13	0.85	20.45	-0.86	0.61
		VE4	3.97	0.89	22.37	-0.61	0.08
		VE5	3.91	0.89	22.82	-0.45	-0.35
		VE6	4.18	0.78	18.7	-0.54	-

				7		0.54
Safety	SA1	3.87	0.81	21.02	-0.45	0.39
	SA2	3.87	0.83	21.48	-0.38	0.13
	SA3	3.80	0.89	23.47	-0.38	-0.08
Nature Preservation	NP1	3.96	0.89	22.46	-0.56	-0.11
	NP2	3.64	0.91	25.00	-0.33	-0.04
	NP3	3.83	0.91	23.63	-0.51	-0.08
Profitability	PROF1	3.98	0.94	23.69	-0.63	-0.20
	PROF2	4.11	0.94	22.84	-0.80	0.01
	PROF3	4.09	1.03	25.22	-0.97	0.38
	PROF4	4.09	0.92	22.61	-0.81	0.31

Sustainable Tourism Management	Social Aspect	SOA1	3.97	0.80	20.21	-0.43	0.02
		SOA2	3.78	0.95	25.01	-0.72	0.51
		SOA3	3.80	0.88	23.17	-0.43	0.27
		SOA4	4.19	0.74	17.70	-0.62	0.18
		SOA5	3.63	0.89	24.40	-0.06	-0.65
		SOA6	3.72	0.85	22.95	-0.03	-0.41
	Economic Aspect	ECA1	4.05	0.83	20.50	-0.51	-0.42
		ECA2	3.93	0.83	21.23	-0.49	0.12
		ECA3	3.76	0.91	24.12	-0.32	-0.40
		ECA4	3.96	0.94	23.73	-0.85	0.59
		ECA5	4.17	0.78	18.7	-0.71	0.41

				9		
	ECA6	3.95	0.83	20.99	-0.46	0.06
Environmental Aspect	ENA1	3.90	0.86	22.07	-0.65	0.74
	ENA2	3.57	0.97	27.27	-0.21	-0.33
	ENA3	3.89	0.98	25.30	-0.90	0.63
	ENA4	3.68	1.01	27.31	-0.53	-0.21

According to Table 16, the descriptive statistics of 63 indicators are based on 17 observed variables namely Relative advantage, Compatibility, Complexity, Firm size, Top management support, Competence, Financial cost, Competitive pressure, Government pressure, External support, Visitor's experience, Safety, Nature preservation, Profitability, Social aspect, Economic aspect, and Environmental aspect.

Relative advantage was measured by 4 statements as indicators which were ordered from highest to lowest mean scores as following: "SAR helps to enhancement visitor's experience. (RA1)", "SAR makes more profit.(RA3)", "SAR has benefit on environment preservation such as having less harm on the environment (RA4)", "SAR makes the nature activity safer.(RA2)" The mean(M) scores were 4.41, 4.18. 3.95, 3.73 respectively. The standard deviation(SD) values were 0.75, 0.82, 0.96, and 0.91.

Compatibility was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR is compatible with my culture existing.(COMP2)”, “SAR is compatible with my nature existing. (COMP1)”, “SAR is compatible with my activity existing.(COMP3)”. The mean(M) scores were 4.26, 4.17, and 4.13 respectively. The standard deviation(SD) values were 0.75, 0.90, and 0.82.

Complexity was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR is difficult to maintenance and maintain as a product.(CX3)”, “It is very difficult to implement SAR. (CX2)”, “SAR is too complex to install in the product.(CX1)”. The mean(M) scores were 3.31, 3.21, and 3.10 respectively. The standard deviation(SD) values were 1.20, 1.24, and 1.25.

Firm size was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “The revenue of our organization is high compared to other organizations.(FS2)”, “The capital of our organization is high compared to other organizations.(FS1)”, “The number of employees is high compared to other organizations. (FS3)”. The mean(M) scores were 3.21, 3.13, and 3.02 respectively. The standard deviation(SD) values were 1.18, 1.15, and 1.27.

Top management support was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “My top management had/has the intension to install SAR in our product.(TMS1)”, “My top management supports to install SAR in our product.(TMS2)”, “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. (TMS3)”. The mean(M) scores were 3.85, 3.81, and 3.65 respectively. The standard deviation(SD) values were 1.21, 1.28, and 1.26.

Competence was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “The employees in my organization are capable to implement SAR. (COM2)”, “The employees in my organization have enough knowledge about SAR.(COM1)”, “How do you think about adopting SAR as the employee in your organization? (COM3)”. The mean(M) scores were 3.54, 3.39, and 3.21 respectively. The standard deviation(SD) values were 1.35, 1.32, and 1.06.

Financial cost was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “It is very expensive to install SAR. (FC1)”, “Financial aid from other organizations is essential to install SAR in the product. (FC3)”, “The cost to install SAR is capable for my organization. (FC2)”. The mean(M) scores were 4, 3.76, and 3.63 respectively. The standard deviation(SD) values were 0.88, 1.12, and 0.95.

Competitive pressure was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “I believe that SAR provides my organization competitive advantage.(CP3)”, “There is a competitive pressure among the tourism industry to adopt SAR as technological innovation for the products.(CP1)”, “I believe that without SAR, my organization loses the customers.(CP2)”. The mean(M) scores were 4.24, 3.96, and 3.46 respectively. The standard deviation(SD) values were 0.88, 0.99, and 1.22.

Government pressure was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “Government announcement about tourism influenced to install SAR in the product.(GP1)”, “Government policy for tourism influenced my organization to install SAR in the product.(GP3)”, “Government announcement about sustainable management

influenced to install SAR in the product.(GP2)". The mean(M) scores were 3.65 for both GP1 and GP3, and 3.55 for GP2. The standard deviation(SD) values were 1.20 for GP1, 1.21 for GP3, and 1.15 for GP2.

External support was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: "External technical aid from other organization is a condition to install SAR.(ES3)", "Partnership with other organization to implement SAR is essential. (ES2)", "How do you think about installing SAR by yourself /your organization?(ES1)". The mean(M) scores were 4.19, 4.13, and 2.93 respectively. The standard deviation(SD) values were 0.87, 0.85, and 1.20.

Visitor's experience was measured by 6 statements as indicators which were ordered from highest to lowest mean scores as following: "Visitor's experience in SAR adopted NBT product is higher than the standard NBT products without technological effect.(VE1)", "Visitors can enjoy the activity more in SAR adopted NBT product than the standard NBT products without technological effect.(VE2)", "I believe that SAR generates the unquantified value for visitors. (VE6)", "Visitors can learn more about culture in SAR adopted NBT product more than the standard NBT products without technological effect.(VE3)", "Visitors can learn more about history in SAR adopted NBT product more than the standard NBT products without technological effect.(VE4)", "Visitors can learn more about environment in SAR adopted NBT product more than the standard NBT products without technological effect.(VE5)". The mean(M) scores were 4.33 for both VE1 and VE2, followed by 4.18 for VE6, 4.13(VE3), 3.97(VE4), and 3.91(VE5). The standard deviation(SD) values were 0.78, 0.79, 0.78, 0.85, 0.89 and 0.89 respectively.

Safety was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “It is safer for visitors to participate in SAR adopted NBT activity than the standard NBT activities without technological effect.”(SA1), “It is safer for employees to implement SAR adopted NBT activity than the standard NBT products without technological effect.”(SA2), “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.”(SA3). The mean(M) scores were both 3.87 for SA1 and SA2, and 3.80 for SA3. The standard deviation(SD) values were 0.81, 0.83, and 0.89 respectively.

Nature preservation was measured by 3 statements as indicators which were ordered from highest to lowest mean scores as following: “Damage in nature is less in SAR adopted NBT product than the standard NBT products without technological effect.”(NP1), “SAR adopted NBT product can help nature preservation.”(NP3), “SAR adopted NBT product can affect to visitor’s perception towards environmental awareness.”(NP2). The mean(M) scores were 3.96, 3.83, and 3.64 respectively. The standard deviation(SD) values were followed by 0.89, 0.91, and 0.91.

Profitability was measured by 4 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR adopted NBT products has more sales than the standard NBT products without technological effect.”(PROF2), “Our total revenue increases with SAR adopted NBT product.”(PROF3), “I believe SAR adopted NBT product contributes to the branding of my organization.”(PROF4), “Profitability of the SAR adopted NBT product is higher than the standard NBT products without technological effect.”(PROF1). The mean(M) scores were 4.11, 4.09 for both PROF3 and PROF4, PROF1 was 3.94. The standard deviation(SD) values

were 0.94, 1.03(PROF3), 0.92(PROF4), and 0.94 respectively.

Social aspect was measured by 6 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR in NBT product positively affects to tourism of communities.”(SOA4), “SAR in NBT product helps to manage social sustainability.”(SOA1), “SAR in NBT product positively affects to the level of community satisfaction.”(SOA3), “SAR in NBT product obtains the understanding by the people in the region.”(SOA2), “SAR in NBT product positively affects to secure tourists.”(SOA6), “SAR in NBT product doesn’t affect to access key assets by the local residents.”(SOA5). The mean(M) scores were 4.19, 3.97, 3.80, 3.78, 3.72, and 3.63 respectively. The standard deviation(SD) values were followed by 0.74, 0.80, 0.88, 0.95, 0.85, and 0.89.

Economic aspect was measured by 6 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR in NBT product benefits to the economic in the destination.”(ECA5), “SAR in NBT product is affective to manage economical sustainability.”(ECA1), “SAR in NBT product positively affects to employment in the region.”(ECA4), “SAR in NBT product benefits to the community.”(ECA6), “SAR in NBT product positively affects to manage tourism seasonality.”(ECA2), “SAR in NBT product helps to prevent tourism profit leakages.”(ECA3). The mean(M) scores were 4.17, 4.05, 3.96, 3.95, 3.93, and 3.76 respectively. The standard deviation(SD) values were also followed as 0.78, 0.83, 0.94, 0.83 for both ECA6 and ECA2, and ECA3 with 0.91.

Environmental aspect was measured by 4 statements as indicators which were ordered from highest to lowest mean scores as following: “SAR in NBT product is affective to manage environmental sustainability.”(ENA1), “SAR in NBT product is

effective to solid waste management."(ENA3), "SAR in NBT product is affective to control noise level."(ENA4), "SAR in NBT product is affective to protect critical ecosystem."(ENA2). The mean(M) scores were 3.90, 3.89, 3.68, and 3.57 respectively. The standard deviation(SD) values were 0.86, 0.98, 1.01, and 0.97.

The coefficient of variation(CV) of the data was between 17.00 to 42.08% that indicates the data distribution is average and suitable for structural equation modeling.

Skewness(SK) values for each indicator were within ±3, and Kurtosis(KU) value was acceptable in a range of -10 to +10, which indicates that the data is in a normal curve and both SK and KU are suitable for SEM. (Kline, 2015)

Therefore, descriptive statistical analysis of all indicators was suitable for multilevel confirmatory factor analysis and Structural equation modeling. (Hair et al., 2014)

Confirmatory factor Analysis

In this part, confirmatory factor analysis is tested by AMOS with 17 observed variables among 5 latent variables namely as:

1. Technological context(TC) with 3 observed variables,
    1) Relative advantage(RA),
    2) Compatibility(COMP),
    3) Complexity(CX),
2. Organizational context(OC) with 4 observed variables,
    4) Firm size(FS),
    5) Top management support(TMS),
    6) Competence(COM),

7) Financial cost(FC),

3. Environmental context(EC) with 3 variables,

8) Competitive pressure(CP)

9) Government pressure(GP)

10) External support(ES)

4. Adoption of Augmented Reality in Nature-based Tourism(ARNBT) with 4 observed variables,

11) Visitor's experience(VE)

12) Safety(SA)

13) Nature preservation(NP)

14) Profitability(PROF)

5. Sustainable tourism Management(STM) with 3 observed variables,

15) Social aspect(SOA)

16) Economic aspect(ECA)

17) Environmental aspect(ENA).

Each indicator is named with observed variables' abbreviation with numbers and the result of CFA is shown in each following table:

Table 16. The result of model fit for confirmatory factor analysis of Technological Context(TC)

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square (x^2)	p>.05	48.793	Pass
x^2/df	< 3	1.877	Pass
GFI	≥0.8	.976	Pass
CFI	≥0.9	.988	Pass
TLI	≥0.9	.979	Pass
AGFI	≥0.8	.949	Pass
RMSEA	≤0.05	.047	Pass

Ten indicators were utilized to estimate TC as showed in Table 17. The author modified the model to fit with CFA referring to Modification indices by drawing the covariance between the errors. After the modification, the model was well fitted shown as x^2 = 48.793, x^2/df=1.877, GFI=.976, CFI=.988, TLI=.979, AGFI=.949, RMSEA=.047 which fit with the criteria and accepted.

Table 17. The result of confirmatory factor analysis of Technological Context (TC)

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
TC	RA	RA	1.018	.059	9.311***	1.035
		RA1	.719	-	-	.518
		RA2	.577	.097	10.061***	.333
		RA3	.714	.092	12.030***	.510
		RA4	.726	.116	11.120***	.527
	COMP	COMP	.737	.062	8.961***	.543
		COMP1	.836	-	-	.699
		COMP2	.863	.056	15.490***	.745
		COMP3	.776	.062	13.714***	.602
	CX	CX	-.310	.062	-5.200***	.096
		CX1	.834	-	-	.653
		CX2	.919	.052	21.311***	.845
		CX3	.808	.049	19.175***	.653
x^2 = 48.793, x^2/df=1.877, GFI=.976, CFI=.988, TLI=.979, AGFI=.949, RMSEA=.047						

***P<.001

As shown in Table 18, the probability in absolute value were less than 0.001 thus all the statements are approximately correct for large samples under suitable assumptions.

The factor loading values were from .577 to .919. When the coefficient prediction (R^2) were from 33% to 84%. The highest factor within all indicators loading was CX2(β=.919) followed by COMP2(β=.863), COMP1 (β=.836), CX1(β=.834), CX3(β=.808), COMP3(β=.776), RA4(β=.726), RA3(β=.714), RA1(β=.719), RA2(β=.577). The Squared Multiple Correlations were .845, .699, .696, 653, .602, .527, .510, .518, and .333 respectively.

Figure 19. CFA of TC

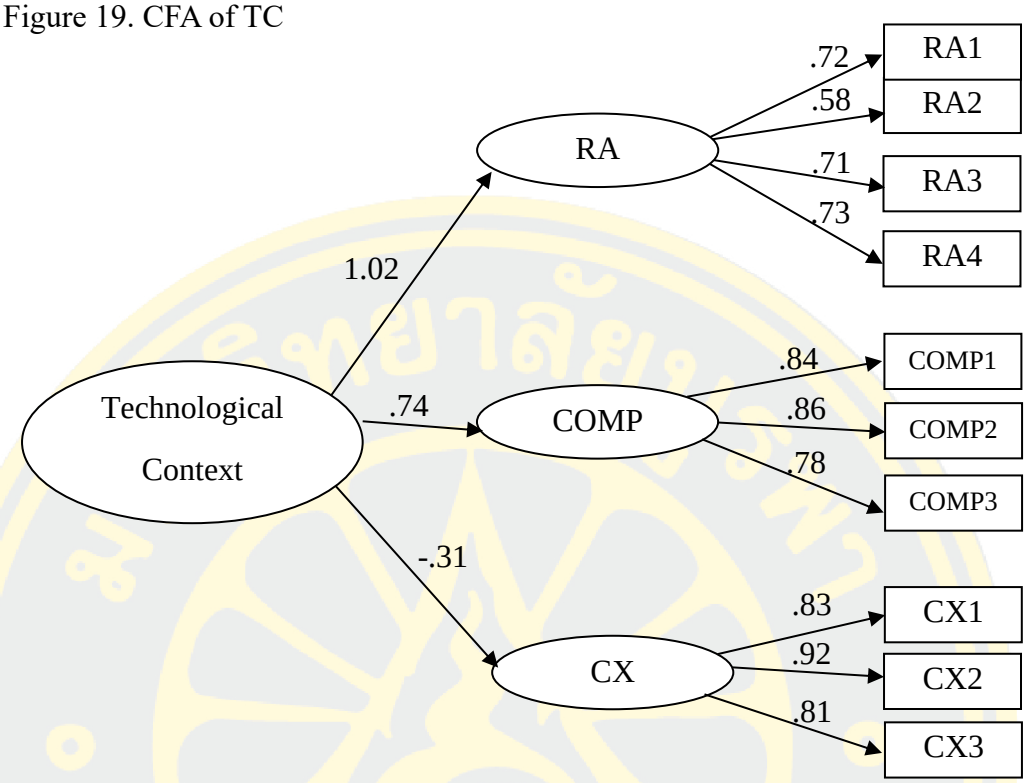


Table 18. The result of model fit for confirmatory factor analysis of Organizational Context(OC)

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square(x^2)	p>.05	35.014	Pass
x^2/df	< 3	1.667	Pass
GFI	≥0.8	.980	Pass
CFI	≥0.9	.996	Pass
TLI	≥0.9	.992	Pass
AGFI	≥0.8	.958	Pass
RMSEA	≤0.05	.041	Pass

Nine indicators were utilized to estimate OC as showed in Table19. The author modified the model to fit with CFA referring to Modification indices by drawing the

covariance between the errors. After the modification, the model was well fitted shown as x^2 = 35.014, x^2/df=1.667, GFI=.980, CFI=.996, TLI=.992, AGFI=.958, RMSEA=.041 which fit with the criteria and accepted.

Table 19. The result of confirmatory factor analysis of Organizational Context(OC)

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
OC	FS	FS	.601	.055	11.497***	.361
		FS1	.915	-	-	.836
		FS2	.915	.037	27.650***	.837
		FS3	.823	.044	22.884***	.678
	TMS	TMS	.753	.058	14.428***	.567
		TMS1	.920	-	-	.846
		TMS2	.908	.038	27.721***	.825
		TMS3	.928	.050	21.039***	.642
	COM	COM	1.097	.063	21.635***	1.203
		COM1	.939	-	-	.881
		COM2	.894	.033	29.420***	.799
		COM3	.786	.031	21.891***	.618
x^2 = 35.014, x^2/df=1.667, GFI=.980, CFI=.996, TLI=.992, AGFI=.958, RMSEA=.041						

***P<.001

As shown in Table 20, the probability in absolute value were less than 0.001 thus all the statements are approximately correct for large samples under suitable assumptions.

The factor loading values were from .786 to .939. When the coefficient prediction (R^2) were from 61.8% to 88.1%. The highest factor within all indicators loading was

COM1(β=.939) followed by TMS3(β=.928), TMS1 (β=.920), FS1 and FS2(β=.915), TMS2(β=.908), COM2(β=.894), FS3(β=.823), COM3(β=.786). The Squared Multiple Correlations were .881, .642, .846, 836, .837, .825, .799, .678, and .618 respectively.

Figure 20. CFA of OC

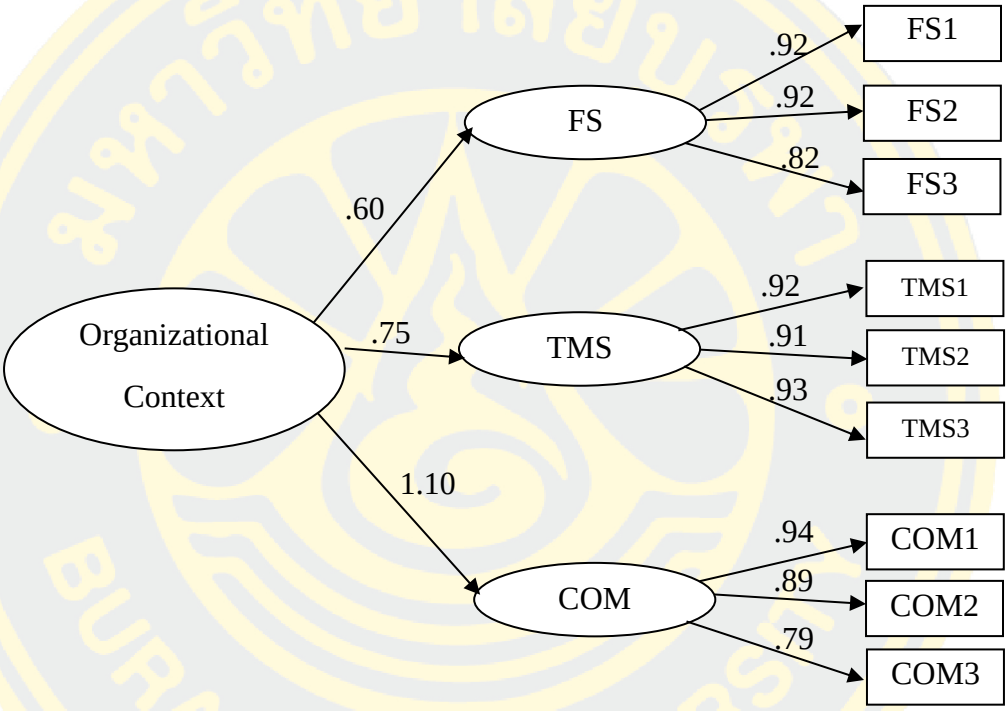


Table 20. The result of model fit for confirmatory factor analysis of Environmental Context(EC)

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square(x^2)	p>.05	19.591	Pass
x^2/df	< 3	1.3	Pass
GFI	≥0.8	.988	Pass
CFI	≥0.9	.997	Pass
TLI	≥0.9	.994	Pass
AGFI	≥0.8	.970	Pass
RMSEA	≤0.05	.028	Pass

Eight indicators were utilized to estimate EC as showed in Table. The author modified the model to fit with CFA referring to Modification indices by drawing the covariance between the errors. After the modification, the model was well fitted shown as x^2 = 19.591, x^2/df=1.3, GFI=.988, CFI=.997, TLI=.994, AGFI=.970, RMSEA=.028 which fit with the criteria and accepted(Table 21).

Table 21. The result of confirmatory factor analysis of Environmental Context (EC)

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
EC	CP	CP	.872	.077	10.805***	.761
		CP1	.959	-	-	.920
		CP2	.645	.072	11.534***	.416
		CP3	.577	.052	10.307***	.333
	GP	GP	.743	.080	9.859***	.551
		GP1	.884	-	-	.782
		GP2	.867	.040	23.413***	.752
		GP3	.903	.041	25.371***	.815
	ES	ES	.440	.047	5.030***	.194
		ES2	.637	-	-	.406
		ES3	.736	.236	5.037***	.542
x^2 = 19.591, x^2/df=1.3, GFI=.988, CFI=.997, TLI=.994, AGFI=.970, RMSEA=.028						

***P<.001

As shown in Table 22, the probability in absolute value were less than 0.001 thus all the statements are approximately correct for large samples under suitable assumptions.

The factor loading values were from .637 to .959. When the coefficient prediction (R^2) were from 33% to 92%. The highest factor within all indicators loading was CP1(β=.959) followed by GP3(β=.903), GP1(β=.884), GP2(β=.867), ES3(β=.736), CP2(β=.645), ES2(β=.637), CP3(β=.577). The Squared Multiple Correlations were .920, .815, .782, 752, .542, .416, .406, and .333, respectively.

Figure 21. CFA of EC

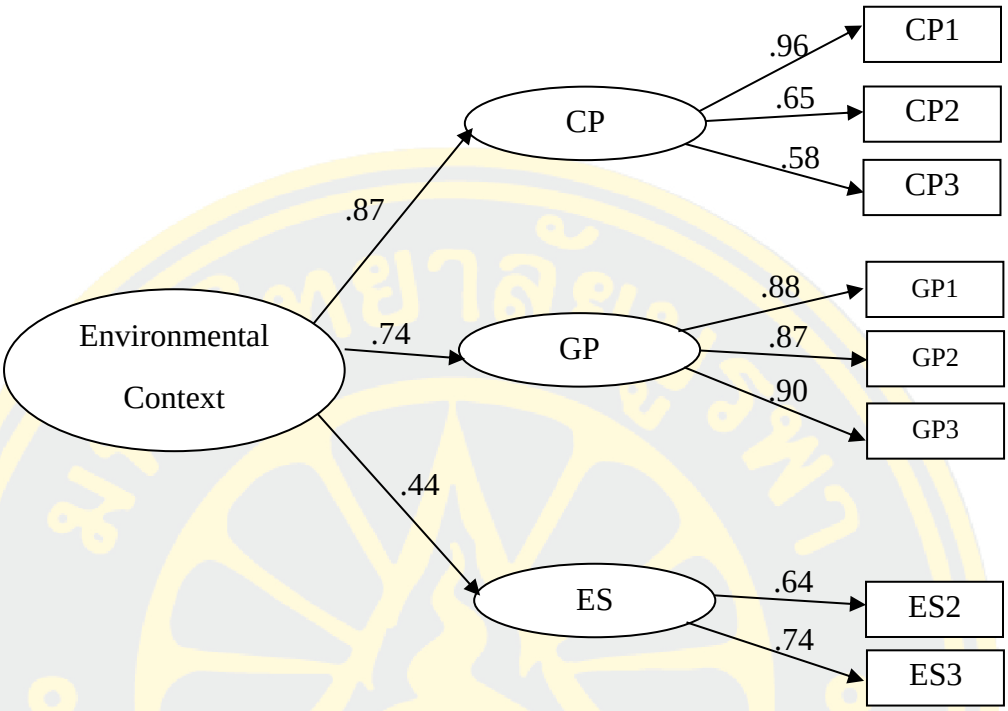


Table 22. The result of model fit for confirmatory factor analysis of Adoption of Spatial Augmented Reality in Nature-based Tourism(ARNBT)

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square(x^2)	p>.05	146.578	Pass
x^2/df	< 3	1.809	Pass
GFI	≥0.8	.956	Pass
CFI	≥0.9	.981	Pass
TLI	≥0.9	.972	Pass
AGFI	≥0.8	.927	Pass
RMSEA	≤0.05	.045	Pass

Eight indicators were utilized to estimate EC as showed in Table 23. The author modified the model to fit with CFA referring to Modification indices by drawing the covariance between the errors. After the modification, the model was well fitted

shown as x^2 = 146.578, x^2/df=1.809, GFI=.956, CFI=.981, TLI=.972, AGFI=.927, RMSEA=.045 which fit with the criteria and accepted.

Table 23. The result of confirmatory factor analysis of ARNBT

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
ARNBT	VE	VE	.877	.035	11.918***	.769
		VE1	.628	-	-	.395
		VE2	.705	.077	15.103***	.497
		VE3	.773	.100	13.564***	.598
		VE4	.676	.114	10.983***	.457
		VE5	.654	.112	10.893***	.428
		VE6	.757	.101	12.217***	.572
	SA	SA	.804	.037	14.780***	.646
		SA1	.848	-	-	.719
		SA2	.837	.058	17.623***	.700
		SA3	.632	.063	13.049***	.400
	NP	NP	.826	.043	12.701***	.682
		NP1	.747	-	-	.558
		NP2	.595	.077	10.539***	.354
		NP3	.753	.078	13.154***	.568
	PROF	PROF	.851	.044	13.765***	.724
		PROF1	.761	-	-	.580
		PROF2	.804	.052	20.428***	.646
		PROF3	.868	.078	15.840***	.754
		PROF4	.710	.073	12.504***	.504
x^2 = 146.578, x^2/df=1.809, GFI=.956, CFI=.981, TLI=.972, AGFI=.927, RMSEA=.045						

***P<.001

As shown in Table 24, the probability in absolute value were less than 0.001 thus all the statements are approximately correct for large samples under suitable assumptions.

The factor loading values were from .637 to .959. When the coefficient prediction (R^2) were from 59.5% to 86.8%. The highest factor within all indicators loading was PROF3(β=.868) followed by SA1(β=.848), SA2(β=.837), PROF2(β=.804), VE3(β=.773), PROF1(β=.761), VE6(β=.757), NP3(β=.753), NP1(β=.747), PROF4(β=.710), VE2(β=.705), VE4(β=.676), VE5(β=.654), SA3(β=.632), VE1(β=.628), NP2(β=.595). The Squared Multiple Correlations were .754, .719, .700, 646, .598, .580, .572, .568, .558, .504, .497, .457, .428, .400, .395 and .354, respectively.

Figure 22. CFA of ARNBT

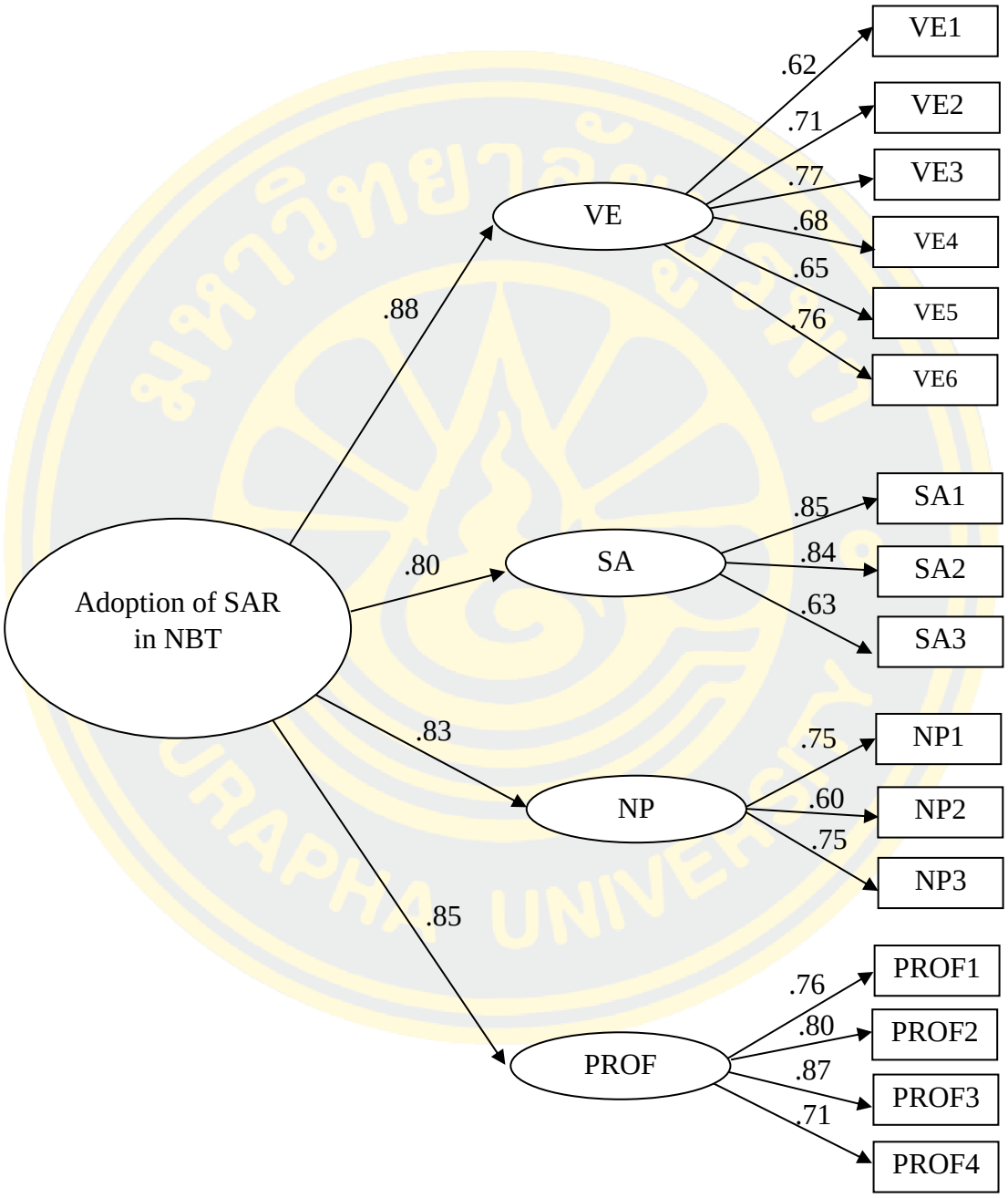


Table 24. The result of model fit for confirmatory factor analysis of Sustainable Tourism Management (STM)

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square (x^2)	p>.05	136.466	Pass
x^2/df	< 3	1.869	Pass
GFI	≥0.8	.961	Pass
CFI	≥0.9	.979	Pass
TLI	≥0.9	.966	Pass
AGFI	≥0.8	.927	Pass
RMSEA	≤0.05	.047	Pass

Sixteen indicators were utilized to estimate STM as showed in Table. The author modified the model to fit with CFA referring to Modification indices by drawing the covariance between the errors. After the modification, the model was well fitted shown as x^2 = 136.466, x^2/df=73, GFI=.961, CFI=.979, TLI=.966, AGFI=.927, RMSEA=.047 which fit with the criteria and accepted (Table 25).

Table 25. The result of confirmatory factor analysis of STM

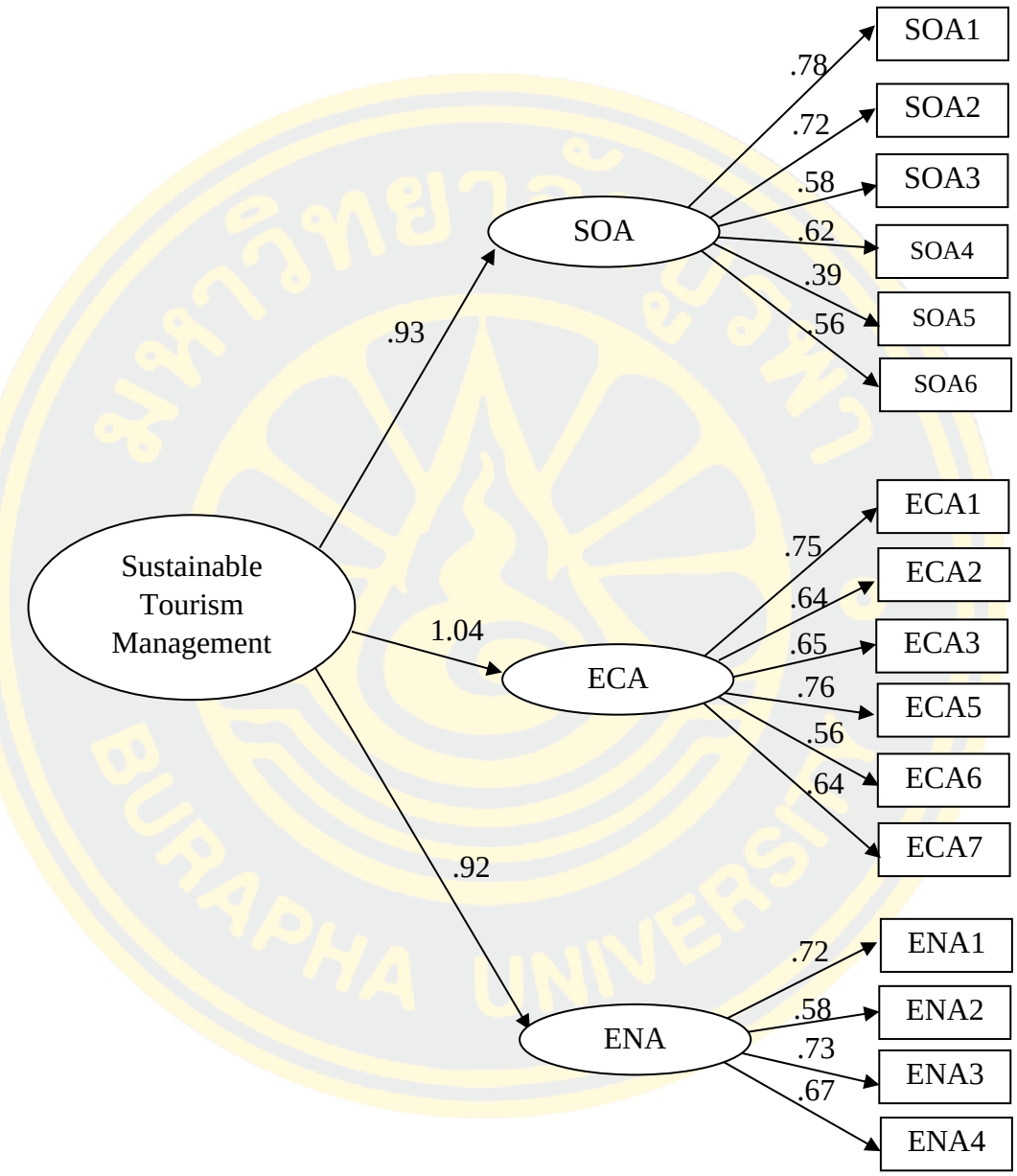
Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
STM	SOA	SOA	.926	.036	15.883***	.857
		SOA1	.776	-	-	.602
		SOA2	.722	1.099	14.340***	.522
		SOA3	.577	.815	10.953***	.333
		SOA4	.617	.061	11.945***	.381
		SOA5	.385	.075	7.341***	.148
		SOA6	.559	.071	10.788***	.313
	ECA	ECA	1.040	.038	17.203***	1.081
		ECA1	.752	-	-	.566
		ECA2	.641	.068	12.618***	.411
		ECA3	.650	.073	12.828***	.423
		ECA4	.756	.083	13.612***	.572
		ECA5	.555	.059	11.779***	.308
		ECA6	.636	.069	12.280***	.404
	ENA	ENA	.916	.040	14.231***	.839
		ENA1	.716	-	-	.513
		ENA2	.579	.075	12.054***	.335
		ENA3	.734	.089	13.180***	.539
		ENA4	.669	.090	12.112***	.447
x^2 = 136.466, x^2/df=73, GFI=.961, CFI=.979, TLI=.966, AGFI=.927, RMSEA=.047						

***P<.001

As shown in Table 26, the probability in absolute value were less than 0.001 thus all the statements are approximately correct for large samples under suitable assumptions.

The factor loading values were from .385 to .776. When the coefficient prediction (R^2) were from 14.8% to 60.2%. The highest factor within all indicators loading was SOA1(β=.776) followed by ECA4(β=.756), ECA1(β=.752), ENA3(β=.734), SOA2(β=.722), ENA1(β=.716), ENA4(β=.669), ECA3(β=.650), ECA2(β=.641), ECA6(β=.636), SOA4(β=.617), ENA2(β=.579), SOA3(β=.577), SOA6(β=.559), ECA5(β=.555), SOA5(β=.385). The Squared Multiple Correlations were .602, .572, .566, 539, .522, .513, .447, .423,.411, .404, .381, .335, .333, .313, 308 and .148, respectively.

Figure 23. CFA of STM



The result of the measurement model by all variables

Table 26. The result of model fit for confirmatory factor analysis of the model

Criteria Index	Good fit or accepted level	Modification Score	Result
Chi-square(x^2)	p>.05	1700.57	Pass
x^2/df	< 3	1.312	Pass
GFI	≥0.8	.874	Pass
CFI	≥0.9	.977	Pass
TLI	≥0.9	.969	Pass
AGFI	≥0.8	.827	Pass
RMSEA	≤0.05	.028	Pass

Sixty-three indicators were utilized to estimate the whole model as showed in Table24. The author modified the model to fit with CFA referring to Modification indices by drawing the covariance between the errors. After the modification, the model was well fitted shown as x^2 = 1700.57, x^2/df= 1.312, GFI=.874, CFI=.977, TLI=.969, AGFI=.827, RMSEA=.028 which fit with the criteria and accepted (Table 27).

Table 27. The result of confirmatory factor analysis of the model

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
TC	RA	RA	.841	-	-	.706
		RA1	.685	-	-	.469
		RA2	.623	0.098	11.39***	.388
		RA3	.688	0.092	12.159***	.473
		RA4	.750	0.121	11.738***	.562
	COMP	COMP	.877	0.138	11.291***	.770
		COMP1	.842	-	-	.709
		COMP2	.684	0.046	14.673***	.468
		COMP3	.754	0.049	16.7***	.568
	CX	CX	-.338	0.14	-5.707***	.114
		CX1	.828	-	-	.685
		CX2	.916	0.044	24.779***	.839
		CX3	.788	0.045	20.551***	.620
OC	FS	FS	.656	-	-	.431
		FS1	.922	-	-	.850
		FS2	.910	0.035	29.182***	.828
		FS3	.814	0.041	23.382***	.662
	TMS	TMS	.927	0.113	13.32***	.860
		TMS1	.924	-	-	.853
		TMS2	.890	0.036	28.707***	.791
		TMS3	.835	0.038	24.876***	.697
	COM	COM	.957	0.113	14.818***	.915
		COM1	.920	-	-	.847
		COM2	.912	0.033	30.839***	.832
		COM3	.792	0.031	22.189***	.627

EC	CP	CP	.962	-	-	.925
		CP1	.825	-	-	.681
		CP2	.771	0.065	17.683***	.594
		CP3	.615	0.046	13.697***	.378
	GP	GP	.777	0.068	15.311***	.604
		GP1	.882	-	-	.778
		GP2	.860	0.038	24.265***	.740
		GP3	.900	0.038	26.734***	.810
	ES	ES	.366	0.043	5.754***	.134
		ES2	.631	-	-	.398
		ES3	.751	0.119	10.394***	.564
ARNBT	VE	VE	.876	-	-	.768
		VE1	.765	-	-	.408
		VE2	.716	0.054	18.391***	.512
		VE3	.758	0.07	15.784***	.575
		VE4	.588	0.074	12.305***	.479
		VE5	.619	0.077	12.486***	.383
		VE6	.745	0.07	14.523***	.555
	SA	SA	.782	0.09	12.066***	.611
		SA1	.845	-	-	.714
		SA2	.845	0.052	19.524***	.713
		SA3	.659	0.059	14.516***	.435
	NP	NP	.875	0.091	12.583***	.766
		NP1	.755	-	-	.570
		NP2	.570	0.066	11.707***	.325
		NP3	.659	0.066	13.489***	.505
	PROF	PROF	.886	0.104	12.389***	.785
		PROF1	.768	-	-	.589
		PROF2	.784	0.046	21.589***	.615
		PROF3	.882	0.064	19.628***	.778
		PROF4	.708	0.059	15.137***	.501

STM	SOA	SOA	.927	-	-	.859
		SOA1	.789	-	-	.622
		SOA2	.718	0.067	15.537***	.516
		SOA3	.527	0.068	10.653***	.278
		SOA4	.640	0.058	13.003***	.410
		SOA5	.389	0.069	7.796***	.151
		SOA6	.574	0.065	11.694***	.330
	ECA	ECA	1.031	0.07	16.382***	1.063
		ECA1	.783	-	-	.613
		ECA2	.660	0.057	14.528***	.436
		ECA3	.636	0.063	13.906***	.404
		ECA4	.656	0.065	14.345***	.431
		ECA5	.594	0.053	13.263***	.407
		ECA6	.617	0.059	13.282***	.380
	ENA	ENA	.920	0.068	13.642***	.846
		ENA1	.704	-	-	496
		ENA2	.541	0.069	12.128***	.292
		ENA3	.742	0.085	14.318***	.550
		ENA4	.770	0.095	13.419***	.486

***P<.001

As shown in Table 28, t value for standardized factor loadings of the items of each construct ranging from .292 to 30.84 found to be significant at level .001 except for Complexity (CX) in Technological context (TC) as insignificant, which marked -5.7 for CR and -.338 as loading score. Moreover, External Support(ES) in Organizational context(OC), and one indicator SOA5 in Social Aspect (SOA) in Sustainable Tourism Management(STM) marked loading score as less than .40 which is considered to be unstable(Guadagnoli & Velicer, 1988). For this matter, considering T-O-E theory framework can be adjusted depends on its context (Crus-Jesus et al.,

2019), those were removed in the final model to pass discriminant validity test.

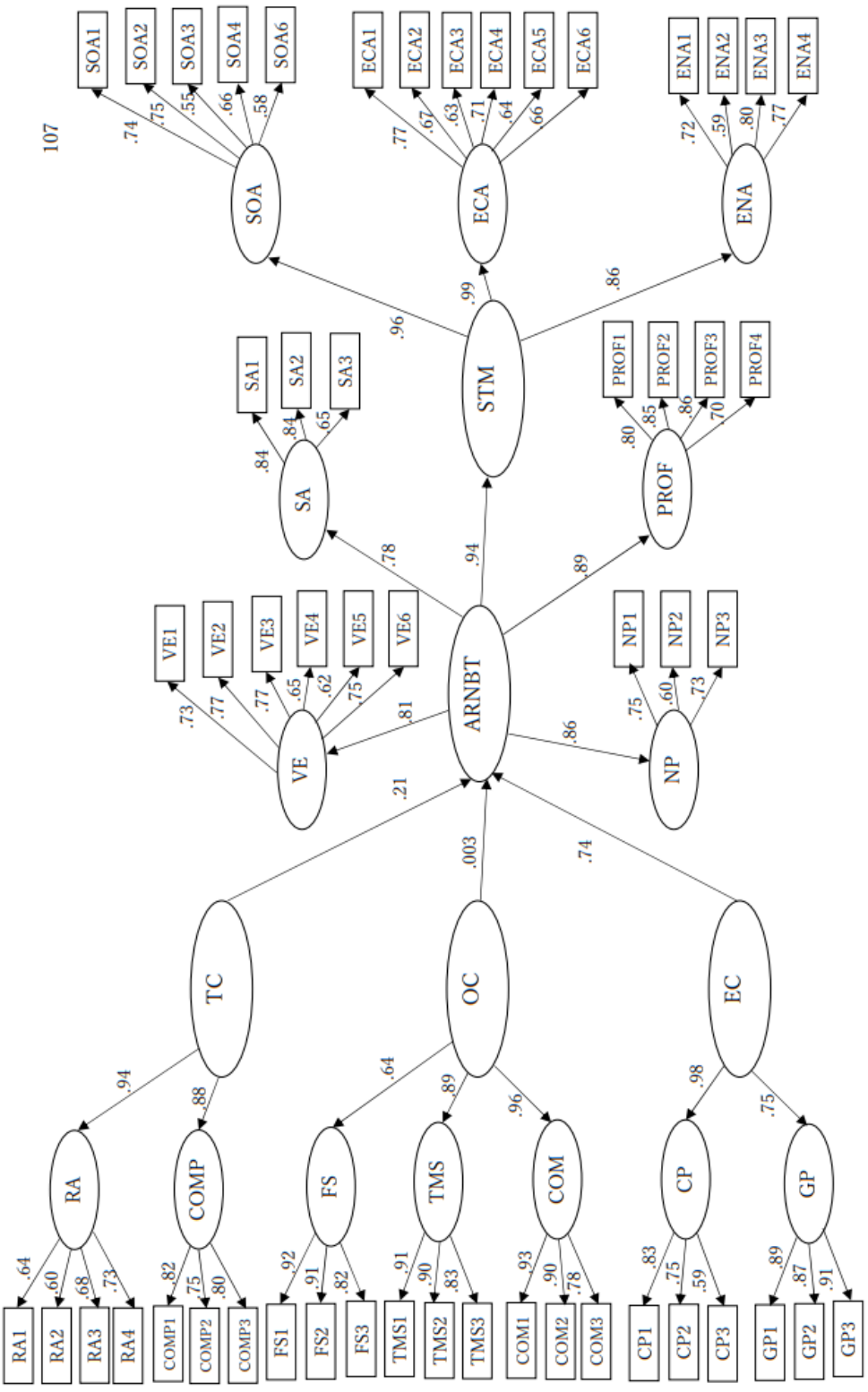
The standardized factor loading stayed between .58 to 1.03 which indicate that constructs are significant and it can be proof the convergent validity (Hair et al., 2014). In addition, Fornell and Lacker (1981) and Hair et al., (2010) suggested that the Construct Reliability (CR) should be higher than 0.7 and the Average Variance Extracted (AVE) is greater than 0.5. Based on table 29 shows that The AVE of each latent variables marked above the criteria such as Technological context (TC)=.74, Organizational context (OC)=.93, Environmental context (EC)=.83, Adoption of SAR in NBT(ARNBT)=.95, and Sustainable Tourism Management (STM)=.99. The CR value of each latent variable were .91, .93, .83, .95, and .95 respectively, which stayed in between 8 to 9. Thus, the constructs can provide adequate evidence of convergent validity since all CR scores were higher than 0.7 (Hair et al., 2010).

Furthermore, discriminant validity clarifies the level of uniqueness of construct from another construct (Peter, 1981) Discriminant validity can be identified by the Fornell and Larker (1981) formula. Average variable extracted (AVE) is required to be greater than average shared variance (ASV) and maximum share variance (MSV). Table 26 shows that each ASV and MSV were lower than AVE value. Hence, the test provided good evidence of discriminant validity.

Table 28. Discriminant validity test

Latent Variables	Composite Reliability(CR)	Convergent Validity(AVE)	Discriminant Validity		Alpha
			ASV	MSV	
TC	.91	.74	0.50	0.30	.85
OC	.93	.74	0.57	0.64	.93
EC	.83	.76	0.53	0.56	.85
ARNBT	.95	.73	0.54	0.37	.92
STM	.99	.92	0.82	0.84	.91

Figure 24. Structure equation model testing



The result of testing construct validity and hypothesis testing

Finally, there were 5 latent variables including 53 indicators to test structural equation modeling, which were used to test the structure equation model in this study. 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 following x^2 = 1506.37, x^2/df= 1.34, GFI=.880, CFI=.976, TLI=.968, AGFI=.830, RMSEA=.029 (Table 30).

Table 29. The result of the structural model fit indices

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square(x^2)	p>.05	1506.37	Pass
x^2/df	< 3	1.34	Pass
GFI	≥0.8	.880	Pass
CFI	≥0.9	.976	Pass
TLI	≥0.9	.968	Pass
AGFI	≥0.8	.830	Pass
RMSEA	≤0.05	.029	Pass

Table 30. Hypothesis summary

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

***P<.001

H1	Technological context effects adoption of SAR in NBT.
H2	Organizational context effects adoption of SAR in NBT.
H3	Environmental context effects adoption of SAR in NBT.
H4	Adoption of SAR effects sustainable tourism management.

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

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

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

Hypothesis three represented the effect of environmental context onto adoption of SAR in NBT. As a result, environmental context(EC) to adoption of AR in NBT(ARNBT) marked relatively high as .737 with acceptable p-value, $p<.001$. Thus, environmental context included descriptive variables namely, competitive pressure (CP), government pressure(GP), and external support(ES) is significant to adoption of AR in NBT and hypothesis three is supported.

Hypothesis four represented the effect of adoption of SAR in NBT onto sustainable

tourism management(STM). As a result, adoption of SAR in NBT(ARNBT) to sustainable tourism management(STM) marked as .936 with acceptable p-value<.001. Thus, adoption of SAR in NBT included descriptive variables namely, visitor's experience(VE), safety(SA), nature preservation(NP), and profitability(PROF) is significant to sustainable tourism management 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 x^2 = 853.074, x^2/df= 1.737, GFI=.899, CFI=.962, TLI=.949, AGFI=.855, RMSEA=.043 (Table 32).

Table 31. The result of model fit for a new model

Criteria Index	**Good fit or accepted level**	**Modification**	**Result**
Chi-square(x^2)	p>.05	853.074	Pass
x^2/df	< 3	1.737	Pass
GFI	≥0.8	.899	Pass
CFI	≥0.9	.962	Pass
TLI	≥0.9	.949	Pass
AGFI	≥0.8	.855	Pass
RMSEA	≤0.05	.043	Pass

Table 32. The standardized factor loading of variables in the new model

Latent Variable	Observed Variables	Acronym	Result			
			β	SE	T (CR)	R^2
EC	CP	CP	.975	-	-	.950
		CP1	.858	-	-	.737
		CP2	.730	0.068	15.501***	.534
		CP3	.583	0.049	12.248***	.340
	GP	GP	.749	0.069	13.824***	.560
		GP1	.885	-	-	.781
		GP2	.865	0.40	23.349***	.749
		GP3	.906	0.41	25.539***	.821
ARNBT	VE	VE	.794	-	-	.622
		VE1	.722	-	-	.522
		VE2	.767	0.072	15.005***	.589
		VE3	.768	0.081	14.328***	.589
		VE4	.652	0.085	12.133***	.425
		VE5	.617	0.087	11.265***	.380
		VE6	.754	0.076	13.966***	.569
	SA	SA	.788	0.106	13.824***	.622
		SA1	.840	-	-	.706
		SA2	.836	0.056	18.190***	.700
		SA3	.653	0.063	13.457***	.426
	NP	NP	.869	0.117	10.967***	.756
		NP1	.740	-	-	.548
		NP2	.607	0.078	10.791***	.368
		NP3	.732	0.076	13.209***	.536
	PROF	PROF	.893	0.126	12.138***	.798
		PROF1	.805	-	-	.649
		PROF2	.845	0.053	19.592***	.714

		PROF3	.856	0.061	19.057***	.732
		PROF4	.695	0.058	14.600***	.484
STM	SOA	SOA	.966	-	-	.934
		SOA1	.735	-	-	.540
		SOA2	.755	0.082	14.837***	.571
		SOA3	.555	0.077	10.725***	.308
		SOA4	.658	0.066	12.629***	.433
		SOA6	.581	0.075	11.167***	.338
	ECA	ECA	.981	0.77	14.280***	.963
		ECA1	.769	-	-	.592
		ECA2	.674	0.064	13.651***	.454
		ECA3	.627	0.070	12.747***	.393
		ECA4	.711	0.073	14.426***	.505
		ECA5	.634	0.061	12.786***	.402
		ECA6	.662	0.065	13.325***	.438
	ENA	ENA	.862	0.079	11.810***	.743
		ENA1	.716	-	-	513
		ENA2	.593	0.083	11.265***	.352
		ENA3	.801	0.093	13.810***	.642
		ENA4	.769	0.094	13.326***	.591

***P<.001

As shown in Table 33, t value for standardized factor loadings of the items of each construct ranging from .35 to .96 found to be significant at level .001. The standardized factor loading stayed between .56 to .98 which indicate that constructs are significant.

Table 34 shows loading score for each path in the new model. EC to ARNBT was .89 and ARNBT to STM as .94 at significant level p<.001.

Figure 25. Structure equation model testing for the new model

e

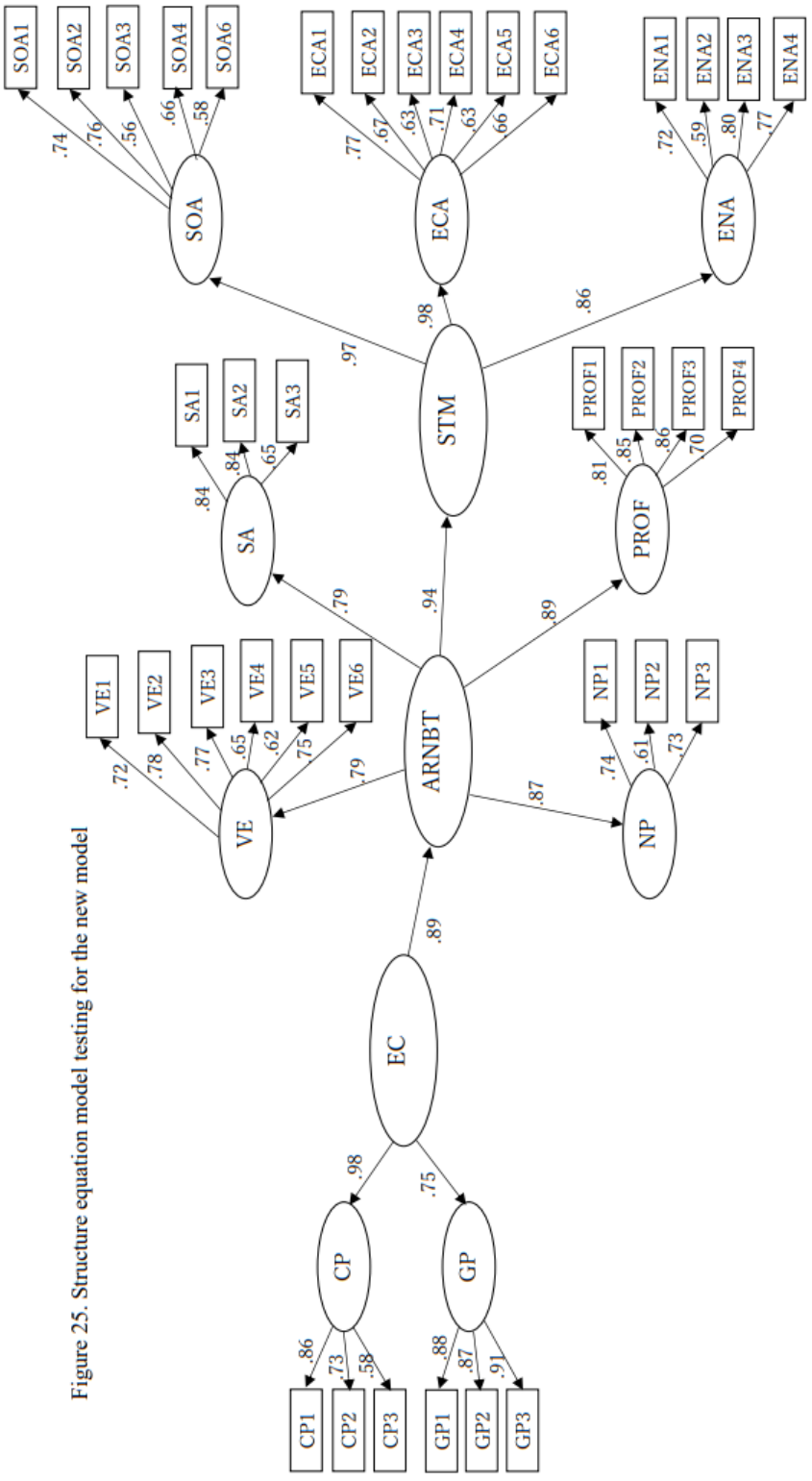


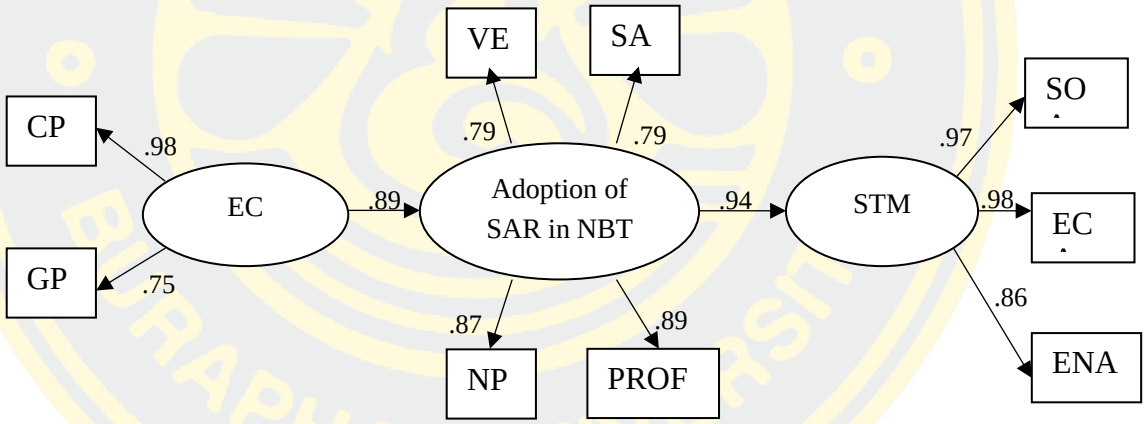
Figure 25. Structure equation model testing for the new model

Table 33. 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
STM ←ARNBT	.942	.106	11.420***	.888

***P<.001

Figure 26. The path diagram of a new model



CHAPTER 5
CONCLUSION, DISCUSSION, AND RECOMMENDATION

This section presents the summary of the research result from the previous chapter. The objectives of the research were; 1) to identify the factors affecting to adopt SAR in nature-based tourism in Japan. 2)to find out the relationship between SAR and sustainable tourism management in Japan. The researcher gathered 402 samples from those who have knowledge of SAR, tourism, nature-based tourism in Japan using quantitative approach and examined structural equation model (SEM) to achieve these goals.

The conclusion of this study is summarized and discussed in this chapter followed by practical implication, recommendation, limitation, and suggestion for future research:

1. Summary of findings
2. Discussion
3. Recommendation for Practical Implication
4. Limitation and suggestion for future research

Summary of finding

The conclusion of the result is addressed in this section including general information, SEM analysis with CFA of variables, and hypothesis testing. The google form for questionnaire was created and distributed through e-mails and some channels of social media to reach target sampling and got 402 respondents.

For general information, 158 respondents' position were "Employee" as 39.3% which was the highest followed by "Manager" 68 respondents(16.92%), "CEO" 56 respondents(13.93%), "Organizer" 52 respondents(12.94%), "Governor" 48 respondents(11.94%), and "Other" 20 respondents (4.98%). The respondents who answered "Other" also mentioned their occupation such as visual artists, technical directors, and self-employed person.

As SAR experience, 272 respondents answered "Yes" which was 67.66% and 130 respondents answered "No" with the rate of 32.34%. This result indicates that more than half of the respondents have the experience using SAR onto Nature-based tourism product. For the future intention of use of SAR, 80.85% of

respondents answered “Yes” and 19.15% answered “No.” In high ratio, many organizations were willing to adopt SAR into their products.

CFA measurement model

As a result, the measurement model may be regarded to be well-fit to the data after the modification. All criteria index reached the standard of the model fit criteria as following x^2 = 1506.37, x^2/df= 1.34, GFI=.880, CFI=.976, TLI=.968, AGFI=.830, RMSEA=.029. Thus, the measurement model may be regarded to be well-fitting to the data. Additionally, a new model after hypothesis testing also reached the standard of the model fit criteria as following x^2 = 853.074, x^2/df= 1.737, GFI=.899, CFI=.962, TLI=.949, AGFI=.855, RMSEA=.043.

Construct reliability & validity

The reliability measurement value was assessed using Cronbach’s alpha coefficient and composite construct reliability. The Cronbach’s alpha of each construction ranged .85 to .93 which is higher than recommended threshold of 0.8. (Nunnally, 1978) These values asses the sufficient consistency of each item. The range of average variance extracted(AVE) was .73 to .92 and the composite reliability was between .83 to .99, which indicates both is acceptable. AVE an CR are used to measure whether the construction is recognized in the data to be the proof the convergent validity. (Urakami & Wakita, 2008) According to Fornell and Larcker (1981), AVE is required to be higher than .50 and CR is higher than .70. As discriminant validity, average shared variance(ASV) and maximum share variance(MSV) were greater than AVE, which describes the test provided good evidence of discriminant validity.

Summary of SEM model

The result of the data analysis was summarized in two stages. Stage one describes objective 1 of the study, which explores the factors that affect adoption of augmented reality in nature-based tourism. Stage two shows developed SEM model for Japanese case about adoption of SAR and its effects to the sustainable tourism management.

Stage1:

Technological context (TC) was composed by two different variables in the final estimation: relative advantage (RA), compatibility (COMP). Each loading score was related advantage .94 and compatibility .88.

Organizational context (OC) was composed by three different variables such as firm size (FS), top management support (TMS), competence (COM). Each factor loading score were .64, .89, .96, respectively. The result indicates that top management support and competence have significant loading score.

Environmental context (EC) was composed by three different variables; competitive pressure (CP), government pressure (GP), which loading score were .98, and .75. Competitive pressure showed the most significant loading score.

Adoption of spatial augmented reality in nature-based tourism (ARNBT) was composed by four different indicators such as visitors experience (VE), safety (SA), nature preservation (NP), profitability (PROF), which loading score were .81, 78, 86, .89 respectively. Profitability of adoption of augmented reality was the most significant among four variables.

Technological context and organizational context showed minimum effect onto adoption of augmented reality in nature-based tourism, which were .21 and .003, respectively with insignificant p-value more than .01. On the contrast, environmental context had highest loading score as 1.23 with $p<0.001$.

Stage2:

The following is the list of observed and latent variables to conclude this study to develop SEM model for adoption of SAR in NBT and the relationship with STM with a case in Japan.

1. Environmental context
   1.1 Competitive pressure with 3 indicators
   1.2 Government pressure with 3 indicators
2. Adoption of SAR in NBT product
   2.1 Visitor's experience with 6 indicators
   2.2 Safety with 3 indicators
   2.3 Nature preservation with 3 indicators

2.4 Profitability with 4 indicators

3. Sustainable tourism management (STM) had three different indicators such as social aspect (SOA), economical aspect (ECA), environmental aspect (ENA).
   3.1 Social aspect had 5 indicators:
      3.1.1 Social sustainability of the product
      3.1.2 Level of community satisfaction
      3.1.3 Effects of tourism on communities.
      3.1.4 Access by the local residents to key assets
      3.1.5 Tourist security
   3.2 Economical aspect had 6 indicators:
      3.2.1 Economical sustainability of the product
      3.2.2 Seasonality
      3.2.3 Profit leakages
      3.2.4 Employment in the region
      3.2.5 Benefit to the economic in the destination
      3.2.6 Benefit to the community
   3.3 Environmental aspect had 4 indicators:
      3.3.1 Environmental sustainability of the product
      3.3.2 Protection for critical ecosystem
      3.3.3 Solid waste management
      3.3.4 Control for noise level

As a result, among sustainable management, economical aspect showed the highest loading score such as .98 followed by social aspect .97 and environmental aspect .86. Profitability was the highest loading score(.89) in adoption of augmented reality in nature-based tourism followed by nature preservation(.87), moreover, it had significant effect to sustainable tourism with the loading score .94. Environmental context had competitive advantage as the highest(.98) and its effect to the adoption was .89.

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 x^2 = 853.074, x^2/df= 1.737, GFI=.899, CFI=.962,

TLI=.949, AGFI=.855, RMSEA=.043.

The objectives of this study were 1) to identify the factors affecting to 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.

Imprecation of the study

As theoretical implications, this study contributes to provide the empirical study for nature-based tourism in Japan as well as the role of technological innovation in nature-based tourism. In addition to it, considering the announcement that Japanese cases for managing sustainability is currently not enough announced by Ministry of Land, Infrastructure, and Transport of Japan. This study may help proving sustainable tourism management theory with the context of augmented reality in nature-based tourism.

In addition to theoretical implications, managerial implications are provided in this study. People who are related to the tourism industry can utilize the result of this study to plan for adaptation of SAR in nature-based tourism product considering sustainable tourism management. They can expect to gain knowledge for strategy to compete with the other organizations or product development for sustainable tourism management.

Limitation and suggestion for future research

This current study does have several limitations and the recommendation for further study as following:

3.3.5 Future research may gather qualitative data to identify technological and organizational context indicators deeply and carefully. It's highly recommended if the future studies can develop the similar research by combining quantitative and qualitative methods, which then the results can be compared and benchmarked to enrich the academic study of adaptation of SAR in nature-based tourism. This research referred to only previous studies with different technology context. Thus, there may have a possibility with the other indicators to be with significant p value.

Therefore, future research may focus on deeply identifying indicators with qualitative data firstly in order to analyze more preciously.

3.3.6 Additionally, some of the respondents in this study may have misunderstood or have a different interpretation from the same organization at individual level. The miscommunication can lead to skewed results. Future research should consider specified organization or specific company to obtain the data from each organization.

3.3.7 The limitation of this research was to be Japanese case. Future research may be implemented in another country to compare the result from this research.

Future studies would also investigate more from different perspectives, which could be visitors' and communities' perspective to evaluate sustainable tourism management for integrated analyze. This study only focused on managerial perspectives, however, sustainable tourism management's evaluation could differ from the result and fact with scientific point of view. Thus, it is highly recommended to conduct the research with different perspectives and scientific data.

REFERENCES

REFERENCES

Ali, A., & Andrew, J. F. (2014). ICT and sustainable tourism development: an innovative perspective. *Journal of Hospitality and Tourism Technology, 5*(1), 2-16. doi:10.1108/JHTT-12-2012-0034

Alsos, G., Eide, D., & Madsen, E. (2014). Introduction: Innovation in tourism industries. In (pp. 1.26).

Angeles, R. (2013). Using the Technology-Organization-Environment framework and Zuboff's concepts for understanding environmental sustainability and RFID: Two case studies. *International Journal of Economics and Management Engineering, 7*(11), 2878-2887.

Baumgartner, H., & Homburg, C. (1996). Applications of structural equation modeling in marketing and consumer research: A review. *International journal of Research in Marketing, 13*(2), 139-161.

Bec, A., Moyle, B., Schaffer, V., & Timms, K. (2021). Virtual reality and mixed reality for second chance tourism. *Tourism Management, 83*, 104256. doi:https://doi.org/10.1016/j.tourman.2020.104256

Bec, A., Moyle, B., Timms, K., Schaffer, V., Skavronskaya, L., & Little, C. (2019). Management of immersive heritage tourism experiences: A conceptual model. *Tourism Management, 72*, 117-120. doi:https://doi.org/10.1016/j.tourman.2018.10.033

Bichler, B. F., & Peters, M. (2020). Soft adventure motivation: an exploratory study of hiking tourism. *Tourism Review*.

Bimber, O., & Raskar, R. (2005). *Spatial augmented reality: merging real and virtual worlds*: CRC press.

Boomsma, A. (1987). The robustness of maximum likelihood estimation in structural equation models.

Bran, E., Bautu, B., & Popovici, D. M. (2020). Towards a Sustainable Future: Ubiquitous Knowledge Mixed Reality Museum. *Procedia Computer Science, 176*, 2878-2885. doi:https://doi.org/10.1016/j.procs.2020.09.266

Buckley, R. (2009). *Adventure tourism management*: Routledge.

Camison, C., & Monfort, V. (2012). Measuring Innovation in Tourism from the

Schumpeterian and the Dynamic-Capabilities Perspectives. *Tourism Management - TOURISM MANAGE, 33*. doi:10.1016/j.tourman.2011.08.012

Cefis, E., & Marsili, O. (2006). Survivor: The role of innovation in firms' survival. *Research policy, 35*(5), 626-641.

Chiu, C.-Y., Chen, S., & Chen, C.-L. (2017). An integrated perspective of TOE framework and innovation diffusion in broadband mobile applications adoption by enterprises. *International Journal of Management, Economics and Social Sciences (IJMESS), 6*(1), 14-39.

Clinch, H., & Filimonau, V. (2017). Instructors' perspectives on risk management within adventure tourism. *Tourism Planning & Development, 14*(2), 220-239.

Choi, Jaehyun. (2023). Research on the Structural Problems of Tourism and the Concept of Overtourism Using the Differing Perspectives of Stakeholders as Case Studies. Japan International Tourism Association, 30, 103-110.

Cochran, W. (1963:75). G. 1963. Sampling techniques. *Nueva York, John Wiley Sons*.

Dibra, M. (2015). Rogers Theory on Diffusion of Innovation-The Most Appropriate Theoretical Model in the Study of Factors Influencing the Integration of Sustainability in Tourism Businesses. *Procedia - Social and Behavioral Sciences, 195*, 1453-1462. doi:https://doi.org/10.1016/j.sbspro.2015.06.443

Divisekera, S., & Nguyen, V. K. (2018). Determinants of innovation in tourism evidence from Australia. *Tourism Management, 67*, 157-167.

Doll, W. J., Xia, W., & Torkzadeh, G. (1994). A confirmatory factor analysis of the end-user computing satisfaction instrument. *MIS quarterly*, 453-461.

Edgell Sr, D. L. (2016). *Managing Sustainable Tourism: A legacy for the future*: Routledge.

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E., & Barlow, C. (2017). Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models. *Business Strategy and the Environment, 26*. doi:10.1002/bse.1939

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience. *Journal of Business Research, 100*, 547-560. doi:https://doi.org/10.1016/j.jbusres.2018.10.050

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. In: Sage Publications Sage CA: Los Angeles, CA.

Fossgard, K., & Fredman, P. (2019). Dimensions in the nature-based tourism experiencescape: An explorative analysis. *Journal of Outdoor Recreation and Tourism, 28*, 100219. doi:https://doi.org/10.1016/j.jort.2019.04.001

Fredman, P., & Margaryan, L. (2020). 20 years of Nordic nature-based tourism research: a review and future research agenda. *Scandinavian Journal of Hospitality and Tourism*, 1-12. doi:10.1080/15022250.2020.1823247

Genc, R. (2020). The Impact of Business Model Innovation on Sustainable Tourism. *The Gaze: Journal of Tourism and Hospitality, 11*(1), 1-9.

George, D., & Mallery, P. (2019). *IBM SPSS statistics 26 step by step: A simple guide and reference*: Routledge.

Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management & Data Systems, 111*(8), 1238-1269. doi:10.1108/02635571111170785

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological bulletin, 103*(2), 265.

Hair, J. F., Black, W. C., & Babin, B. J. (2018). *Multivariate Data Analysis*: Cengage.

Hansen, M., Hjalager, A.-M., & Fyall, A. (2019). Adventure tourism innovation: Benefitting or hampering operations? *Journal of Outdoor Recreation and Tourism, 28*, 100253. doi:https://doi.org/10.1016/j.jort.2019.100253

Hansen, M., Rogers, D., Fyall, A., Spyriadis, T., & Brander-Brown, J. (2019). Collaborative industry risk management in adventure tourism: A case study of the US aerial adventure industry. *Journal of Outdoor Recreation and Tourism, 28*, 100218. doi:https://doi.org/10.1016/j.jort.2019.03.008

Hjalager, A.-M. (2015). 100 innovations that transformed tourism. *Journal of Travel Research, 54*(1), 3-21.

Hunt, C. A., & Harbor, L. C. (2019). Pro-environmental tourism: Lessons from adventure, wellness and eco-tourism (AWE) in Costa Rica. *Journal of Outdoor Recreation and Tourism, 28*. doi:https://doi.org/10.1016/j.jort.2018.11.007

Jones, T. (2009). Nature-based tourism in a Japanese national park–A case study of Kamikochi.

JTA. (2020). *感染拡大防止と観光需要回復のための政策プラン（案）について*. Retrieved from

Knowles, N. L. B. (2019). Targeting sustainable outcomes with adventure tourism: A political ecology approach. *Annals of Tourism Research, 79*, 102809. doi:https://doi.org/10.1016/j.annals.2019.102809

Kuramoto, Hiroyuki, & Ide, Akira. (2023). A Study on Sustainable Tourism Research in Shiroyome Senmaida Rice. *Journal of Tourism Research*, *64*, 13-23.

Kyriakou, P., & Hermon, S. (2019). Can I touch this? Using Natural Interaction in a Museum Augmented Reality System. *Digital Applications in Archaeology and Cultural Heritage, 12*, e00088. doi:https://doi.org/10.1016/j.daach.2018.e00088

Lin, H.-F. (2014). Understanding the determinants of electronic supply chain management system adoption: Using the technology–organization–environment framework. *Technological Forecasting and Social Change, 86*, 80-92. doi:https://doi.org/10.1016/j.techfore.2013.09.001

Li, Xinyi, & Chen, Hui (2023). Changes with China's Tourism with COVID-19. Memories of the Kokushikan University Information Science, 44, 1-8.

Løseth, K. (2017). Knowledge development in adventure tourism businesses – the influence of serious leisure. *Annals of Leisure Research, 21*, 1-17. doi:10.1080/11745398.2017.1406808

Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism Management, 77*, 104028. doi:https://doi.org/10.1016/j.tourman.2019.104028

McKay, T. (2013). Adventure tourism: Opportunities and management challenges for SADC destinations. *Acta Academica, 45*, 30-62.

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. *IEICE TRANSACTIONS on Information and Systems, 77*(12), 1321-1329.

Mine, M. R., Van Baar, J., Grundhofer, A., Rose, D., & Yang, B. (2012). Projection-based augmented reality in disney theme parks. *Computer, 45*(7), 32-40.

Ministry of Land, I., Transport and Tourism. (2019). *持続可能な観光政策の在り方に関する調査研究*.

Moscardo, G. (2008). Sustainable Tourism Innovation: Challenging Basic Assumptions. *Tourism and Hospitality Research, 8*(1), 4-13. doi:10.1057/thr.2008.7

Novelli, M. (2005). *Niche tourism: Contemporary issues, trends and cases*: Routledge.

Nunnally, J. C. (1978). An overview of psychological measurement. *Clinical diagnosis of mental disorders: A handbook*, 97-146.

Oie, T. (2009). The study on tourism resources and tourists attractions. *大阪観光大学紀要*(9), 11-19. doi:info:doi/10.20670/00000086

Pérez, V., Guerrero, F., González, M., Pérez, F., & Caballero, R. (2013). Composite indicator for the assessment of sustainability: The case of Cuban nature-based tourism destinations. *Ecological Indicators, 29*, 316-324. doi:https://doi.org/10.1016/j.ecolind.2012.12.027

Polat, N. (2015). Technical Innovations in Cruise Tourism and Results of Sustainability. *Procedia - Social and Behavioral Sciences, 195*, 438-445. doi:https://doi.org/10.1016/j.sbspro.2015.06.486

Pröbstl, U., & Haider, W. (2013). Challenges for outdoor recreation and nature based tourism. *Journal of Outdoor Recreation and Tourism, 1-2*, iii-iv. doi:https://doi.org/10.1016/j.jort.2013.05.001

Ratten, V., & Braga, V. (2019). Tourism innovation. *Journal of Hospitality and Tourism Management, 41*, 171-174. doi:https://doi.org/10.1016/j.jhtm.2019.10.002

Revellat, P. (2019). Top 20 Best Projection Mapping Examples to get Inspiration for your Event. *https://tradefest.io/blog/en/top-20-best-projection-mapping-examples/*.

Rodríguez, I., Williams, A. M., & Hall, C. M. (2014). Tourism innovation policy: Implementation and outcomes. *Annals of Tourism Research, 49*, 76-93. doi:https://doi.org/10.1016/j.annals.2014.08.004

Sand, M., & Gross, S. (2019). Tourism research on adventure tourism – Current

themes and developments. *Journal of Outdoor Recreation and Tourism, 28*, 100261. doi:https://doi.org/10.1016/j.jort.2019.100261

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*: psychology press.

Schumpeter, J. A. (1984). The meaning of rationality in the social sciences. *Zeitschrift für die gesamte Staatswissenschaft/Journal of Institutional and Theoretical Economics*(H. 4), 577-593.

Silvers, J. R. (2005). The Potential of the EMBOK as a Risk Management Framework for Events

Smith-Christensen, C. (2009). Sustainability as a concept within events. *Event Management and Sustainability*, 21-31.

Swarbrooke, J., Beard, C., Leckie, S., & Pomfret, G. (2003). *Adventure tourism: The new frontier*: Routledge.

Taylor, S., Varley, P., & Johnston, T. (2013). *Adventure tourism: Meaning, experience and learning* (Vol. 36): Routledge.

Tohãnean, D., Buzatu, A. I., Baba, C.-A., & Georgescu, B. (2020). Business Model Innovation Through the Use of Digital Technologies: Managing Risks and Creating Sustainability. *Amfiteatru Economic, 22*(55), 758-774.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on engineering management*(1), 28-45.

Total Population Data in Nagasaki Prefecture. (2020). Nagasaki city.

UNWTO. (2012). *Green innovation in tourism can trigger major economic, social and environmental benefits.* . Press Release.

UNWTO. (2014). Global Report on Adventure Tourism 2014.

Urakami, & Wakita. (2008). 心理学・社会科学研究のための調査系論文の読み方. *東京図書・原田宗彦, 押見大地, 福原崇之 (2014)『J リーグマーケティングの基礎知識』, 創文企画・宮澤薫 (2011)「ブランド・コミュニティとの同一化の影響―同一化に先行する要因と結果の再検討―」,『千葉商大論叢』, 44*(1), 201-220.

Waligo, V. M., Clarke, J., & Hawkins, R. (2013). Implementing sustainable tourism: A

multi-stakeholder involvement management framework. *Tourism Management, 36*, 342-353. doi:https://doi.org/10.1016/j.tourman.2012.10.008

Wang, Y.-S., Li, H.-T., Li, C.-R., & Zhang, D.-Z. (2016). Factors affecting hotels' adoption of mobile reservation systems: A technology-organization-environment framework. *Tourism Management, 53*, 163-172. doi:https://doi.org/10.1016/j.tourman.2015.09.021

Weidenfeld, A., Williams, A. M., & Butler, R. W. (2010). Knowledge transfer and innovation among attractions. *Annals of Tourism Research, 37*(3), 604-626.

Weiermair, K. (2006). Product improvement or innovation: what is the key to success in tourism?

Williams, P., & Soutar, G. N. (2009). Value, satisfaction and behavioral intentions in an adventure tourism context. *Annals of Tourism Research, 36*(3), 413-438.

Zainudin, N. M., & Tasnim, R. (2020). Business Practices to Minimize SafetyRisks: A Case Study of Two Adventure Tourism Businesses in Malaysia.

BIOGRAPHY

NAME	Meiko Okamura
DATE OF BIRTH	27 May 1991
PLACE OF BIRTH	Yamaguchi Japan
PRESENT ADDRESS	The Room Condo 1, 18/47, Bangsaen Sai 4 Nuea, SaenSuk, Mueang Chon Buri, Chonburi 20130
POSITION HELD	2017 May - Present Burapha university, Piboonbumpen Demonstration School, Thailand 2016 Nov. - 2017 Apr. English teacher, Polestar, Yamaguchi, Japan 2015 Apr. - 2016 Oct. English teacher, Deats English, Yamaguchi, Japan 2013 Sep. - 2014 Aug. Japanese teacher, Bishops university, Quebec, Canada
EDUCATION	2019 - Present Burapha University (Thailand), Master of International Tourism Management 2022 Jan.-Mar. Montpellier University(France), double degree program 2010 - 2015 Yamaguchi Prefectural University (Japan), Bachelor of International Culture 2014 Centre Saint-Michel (Canada), French