

## ORIGINAL RESEARCH ARTICLE

# A proposal for a common framework for smart tourism cities with regional revitalization

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### ABSTRACT

Applying networking and connectivity to empower human resources and infrastructure towards the formation of sustainable regional service ecosystems is becoming increasingly important for well-being of people within and outside society to meet social challenges. However, the concepts of smart city (SC) for residents/citizens and smart tourism destination (STD) for visitors/tourists are not yet well coordinated. Therefore, this research provides a framework for regional innovation through “smartization”, which is common to both SC and STD. The framework is constructed from the perspective of the service ecosystem and applied by analysis of four case studies: two representative smart city projects (“urban policy”-directed type) (Toyama and Aizu-Wakamatsu), and two advanced tourism projects (“resource integration”-directed type) in Japan and Slovenia. Based on these examples, the framework clarifies the macro aspects of human resources and infrastructure’s roles with data platform and presents a smartization model with service layers and dynamic spiral through integrating to the concept of Smart Tourism City (STC): a city that aims to improve/create QoL (quality of life) and QoE (quality of experience) for citizens and tourists. It is expected that further STC-concept-based research towards building the quantitative model will lead to concrete insights into the typology of holistic servitisation of each city or region.

**Keywords:** smart city; smart tourism destination; infrastructure; human resource; service ecosystem

## 1. Introduction

### 1.1. Research background and history

In order to solve urban and regional problems and increase the pride of citizens and residents living

there, as well as their attractiveness to visitors and travelers, it has become necessary to take a more conventional approach from the perspective of “comprehensive servicing of the city. Today, for example, the avoidance of concentration at certain times and places, such as traffic congestion and over-tourism, as well as the avoidance of encapsulation,

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density, and closeness in a quarantine, work, and living environment in an adaptive manner, are common challenges for future urban and regional policies beyond individual domains. In regional cities, it is essential to improve quality through cooperation and reorganization even as the size of local communities shrink, such as maintaining public infrastructure and improving medical and welfare services to overcome declining population and tax revenues. The viewpoint of comprehensive urban services is becoming increasingly important in this regard.

The concept of smart city has been conceived since the 1990s and promoted in Japan and overseas as a measure aimed at solving problems in cities and regions, improving the quality of life (QoL) of citizens, and developing growth. We will work on transportation, energy, life, medical welfare, environmental conservation, etc. by applying information and communication technology (hereinafter referred to as ICT), which is rapidly evolving. In the 2010s, with the use of cloud and IoT, the trend toward optimization and sophistication of urban functions and citizens' lives based on the operational data of infrastructure and services became conspicuous<sup>[1]</sup>. Furthermore, from the perspective of CPS (cyber physical system), the trend of applying the construction of a digital twin model to urban spaces and aiming for infrastructure management and improvement of work / living environment by social implementation in the entire city has begun<sup>[2]</sup>. On the other hand, in recent years, there has been a demand for cooperation in the participation process of citizens and measures to attract customers with the aim of creating an attractive town<sup>[3]</sup>. Regarding the role of urban / regional infrastructure, not only software-related infrastructure but also hardware-related infrastructure is required to be newly positioned to support services<sup>[4]</sup>.

Attracting visitors and travelers from outside the region is essential for the growth and development of cities and regions. In tourism projects aimed at regional revitalization, the need for mass tourism is decreasing, and it has become important to improve the quality of experience (referred to as quality

of experience or QoE in this paper) to meet the needs of individual visitors, instead of touring around tourist attractions. For example, tourism-oriented art festivals (hereinafter referred to as "AF"), which have been developed in more than 100 locations over the past 20 years in Japan, have contributed to attracting not only art fans to remote areas but also visitors from Japan and abroad. AFs offer value-added experiences through site-specific art that can be enjoyed only in the local area, such as the ruins of public facilities and traditional houses, against the backdrop of local culture and the natural environment. Local human resources with the knowledge and discernment to discover and utilize local resources are important in this context, and they also contribute to increasing the number of visitors, people from the local area, and companies in and outside of the area<sup>[5]</sup>.

Especially in cities and regions where the population is aging, there are not many local leaders, and it is important to secure human resources who have a strong sense of ownership and are actively involved in the community. In addition, systems and functions that can empower people to collaborate with the government and businesses are required. Furthermore, in order to slim down administrative costs, it is necessary to reduce the operation and maintenance costs of the various infrastructures that support local jobs and lifestyles. In order to reduce operation and maintenance costs of infrastructures More efficient management and renewal of infrastructures are required to reduce the operation and maintenance costs of various infrastructures that support local jobs and lifestyles<sup>[6]</sup>. In addition, from the perspective of tourism, old and new infrastructures are also an important tourism resource from the viewpoint of tourism. Here, people, hardware, software, and software. In order to position the common role of people, hardware and software infrastructure, it is also necessary to position them as social common capital<sup>[7]</sup>. In this context, it is also necessary to consider the role of infrastructure in terms of securing the means of transportation for citizens and residents, securing a quarantine environment, and sustainable utilization as a local resource. In this context, it is necessary to

work on the “comprehensive servicing of cities” from the viewpoint of infrastructure, such as securing means of transportation for citizens and residents, securing quarantine environment, and sustainable use of local resources.

## 1.2. Research problem, purpose, and approach

As described above, the linkage between smart city policies and the coordination of smart city policies and tourism projects is currently left to the individual response of each city, both domestically and internationally. The collaboration between the two is a typical example of the comprehensive servicing of a city, and an approach that transcends both research fields and can respond to social needs is required. An approach that transcends both research fields and can respond to social needs is required.

The research on smart cities has mainly focused on innovation through the use of ICT in cities and related design and implementation methods<sup>[8,9]</sup>. Here, the positioning of infrastructure from the viewpoint of smart city is centered on software infrastructure for data utilization (mainly corresponding to data infrastructure), and hardware infrastructure (mainly corresponding to public infrastructure). Research to systematize the multifaceted role of hardware infrastructure (mainly, public infrastructures) has not been conducted for the most part. In addition, research approaches that take into account the improvement and creation of the quality value of travelers’ experiences have not been sufficiently conducted<sup>[10,11]</sup>. In addition, tourism research is based on tourism research that is consistent with “sustainable development” in various regions, and is also based on the efforts of DMOs (destination management organizations) that coordinate local stakeholders in the tourism region. In the efforts of DMOs (destination management organizations) that coordinate local stakeholders, it has gradually become necessary to take a perspective of “co-creation” with stakeholders, including governments and NPOs, as well as collaboration with common urban and regional initiatives<sup>[12,13]</sup>.

The research questions are: “What is the common framework from an innovation perspective for smart city measures and tourism projects that aim at regional revitalization and problem-solving? What are the service layer configurations and smart city measures to promote both in the common framework? In other words, the purpose of this study is to present and examine a common framework for smart city policies and smart tourism projects. If we can establish a perspective that can look at the above, it will lead to the clarification of the relationship between smart city policies and smart tourism destinations in terms of citizen participation and visitor attraction, as well as infrastructure and data utilization. This will provide an opportunity to align smart city policies with tourism projects and contribute to the construction of the concept of the so-called smart tourism city<sup>[9]</sup>. It can also clarify the direction of infrastructure and data utilization that takes advantage of regional characteristics, as well as the direction of regional digital transformation, sustainability, and smart city measures, and provide practical perspectives on the proactive participation of citizens and human resource utilization processes associated with the utilization of regional resources. Moreover, describing and analyzing the comprehensive servitization of cities from the perspective of service ecosystems can contribute to building a perspective on the development process of participation and value co-creation by urban and regional actors<sup>[1,14–16]</sup>.

For the above research questions and objectives, this study first adopts a “hermeneutic research approach”<sup>[17]</sup>. The study is intended to analyze what and how the stakeholders and players involved in smart city policies and smart tourism and destination projects are thinking in the context of these projects and to identify common ground from an innovation perspective. and the context in which they are involved in and building framework from an innovation perspective and a viewpoint of smart and the viewpoints of smart policies that reflect the characteristics of each region.

This common framework and the smart development measures focus on the regional revitalization cases of small and medium-sized cities and regions, aiming to identify items that lead to measurable indicators that can be used as the basis for building quantitative models of the smart development process in the next step.

## **2. Review of previous studies**

### **2.1. Smart city concept and its transition**

The concept of smart city (abbreviated as SC in this paper), which is the premise for smart tourism destination (abbreviated as STD in this paper), and its transition are described. The SC was proposed as a measure to improve the QoL of citizens and to promote their growth and development by utilizing ICT, which has evolved remarkably. Since then, the diverse developments of the Internet environment in the ICT domain have broadened the scope of services and attracted attention to a new trend of integrating critical urban infrastructure and services through the progress of IoT and cloud-based IT utilization. In this paper, such technological trends in general will be referred to as “smart technologies” in contrast to conventional ICT.

In the studies on the comparison of SCs that have already expanded in various forms, the analysis of success factors through conceptualization, and the prediction of future technological developments, the common characteristics include: (1) application of various ICTs to cities and communities, (2) integration into administrative systems, (3) transformation of the living and working environment within a region, and (4) promotion of innovation and knowledge creation. The common characteristics are (1) application of various ICTs to cities and communities, (2) integration into administrative systems, (3) transformation of the local living and working environment, and (4) promotion of innovation and knowledge. (1) and (2) are expected to foster urban functional efficiency and cultural development, while (3) is expected to foster creativity that leads to business development<sup>[18,19]</sup>. In order to realize the

above characteristics, factors from the technological, human, and institutional perspectives have been analyzed in successful cases<sup>[8]</sup>. The technological perspective focuses on “infrastructure” in terms of both hardware and software, the human perspective focuses on “education” that leads to creativity and diversity, and the institutional perspective focuses on “participatory governance” for policy promotion. From these three perspectives, it is considered that investment in human and social capital and infrastructure leads to sustainable growth and improved quality of life.

In Japan, the main efforts have been in the areas of “energy conservation and disaster prevention measures,” “administrative cost reduction for aging communities,” and “maintenance of transportation and living infrastructure,” especially in the wake of the Tohoku earthquake. Data utilization of these public services and infrastructures” has been promoted in several dozen cities and regions across Japan in the form of trials of “characteristics of each city and region and various ICT technologies<sup>[20]</sup>. Currently, efforts are being made with a future vision that aims for cross-disciplinary collaboration and the achievement of the SDGs, such as medical and nursing care services and disaster prevention and transportation. On the other hand, in order to create a common framework of best practices for data utilization, the reference architecture of SCs, including service functions, utilization data and its data linkage, and on-site device layers, is specified as “urban OS” etc., and the generalization of the “soft” infrastructure is being promoted. Domestic and international efforts to generalize the “soft” infrastructure are progressing<sup>[21]</sup>.

### **2.2. Concept of smart tourism destination and its transition**

Smart Tourism STD Destination (hereafter referred to as STD) was presented with an awareness of the measures and progress of the SC<sup>[9]</sup>. While the main aim of SC is to grow urban areas and improve the quality of life of citizens and residents, the initial

aim of STD is to improve competitiveness as a destination of choice and to enhance the quality of the traveler's experience. STD's initial aim is to increase competitiveness as the destination of choice and to improve the quality of the traveler's experience. STD is a shift from marketing to innovative travel destinations with value creation of travel experiences. STD aims to be an innovative travel destination with value creation of the travel experience. In order to achieve this, the following characteristics are further aimed to be realized<sup>[11]</sup>: 1) to coordinate visitor interaction and local integration, 2) to ensure sustainable development of the region leading to an improved quality of experience for travelers and quality of life for residents, and 3) to build infrastructure that is accessible to all parties involved. Infrastructure that is accessible to all parties involved. Here, intensive information sharing and value co-creation for (1), and creation, management, and provision of intelligent travel services and experiences for (2) and (3), are the key elements.

The term "smartness" commonly used for both SC and STD can have a variety of meanings depending on the degree of progress. For example, it includes urban policy perspectives aiming for healthy urban growth and quality of life and experience, user convenience perspectives such as adaptive and user-friendly, and infrastructure technology perspectives such as self-healing and autonomous optimization of urban buildings and facilities<sup>[8]</sup>. Furthermore, urban smartness may also include a resource integration perspective with respect to the ability to attract and mobilize human resources and local resources<sup>[23]</sup>, including natural and cultural resources<sup>[24]</sup>, for collaboration among diverse organizational and individual actors through ICT utilization.

The development of smart in the STD field can be organized as follows in contrast to e-Tourism, which has become popular since the 2000s based on travel planning and recommendation functions<sup>[22]</sup>. The evolution of the paradigm of travel from interactivity to the structure of the travel business has changed from a value chain/intermediary type to an ecosystem type, and the exchange of travel resources

has changed from B2B, B2C, and C2C type business to a PPC (public-private-consumer) collaborative type. In order to increase the feasibility of STD through the effects of these smart technologies, the coordination of smart elements across both hardware and software, support by human capital, leadership, innovation, and social capital are positioned as core elements<sup>[25]</sup>.

### 2.3. Request for common smart city and smart tourism destination initiatives

In the previous section, we have discussed the ICT-based smart technology and STDs, as well as the contemporary demand for a comprehensive approach that satisfies both residents' QoL and travelers' QoE.

In recent years, as a measure for utilizing smart technology, it has become necessary to take measures from a holistic view that straddles SC measures and STDs more than before. Ivars-Baidal et al.<sup>[26]</sup> qualitatively analyzed the degree of coordination between the two strategies regarding over-tourism in the five major European cities, the direction of the strategy, the way of recognizing the current situation, and the measures to deal with it. There is. From the analysis results, (1) overcoming silos between organizations to avoid double management, (2) knowledge management through dialogue between cities and travel processes, (3) influence of stakeholders including residents and travel companies, and (4) preventive approaches are pointed out. Here, we point out the need for an integrated smart tourism city (STC) model that can be reflected in various stakeholders based on knowledge of the interaction between cities and tourism processes.

Furthermore, with regard to the integration of travelers as well as citizens in the SC from the perspective of improving QoL, Ceylan<sup>[27]</sup> proposes a model that integrates the host residents, travelers, public institutions, travel operators, and travel operators. Ceylan<sup>[27]</sup> is a collaborative ecosystem of host residents, travelers, public institutions, travel operators, and travel agents. Ecosystem collaboration and

regional versions It describes the prospects for digital transformation (DX). In addition, the report also discusses the future of sustainable tourism, which has been a traditional Sustainable Tourism<sup>[19,28]</sup>, it is becoming increasingly important to go beyond the realm of STDs and work from a common perspective to create sustainable cities and regions at the SC level.

However, we are currently in the transition period to a “smart society,” so to speak, and full-scale social implementation of SCs and STCs has yet to begin in any case. Research on quantitative categorization, including correlation and causal relationships, is still in the research stage<sup>[29]</sup>. Furthermore, the purpose of SC is changing from energy management to solving problems and creating services and solutions that are closer to the daily lives of citizens. As a result, the purpose of smart urbanization is not only to enhance and upgrade urban functions, but also to increase the weight of acceptance, work, and life of the people involved. Research on evaluation indices for citizen satisfaction, QoL, and happiness (Well-Being), which can be regarded as representative objective functions for evaluating these, is still in the process of being researched, as a cross-disciplinary approach that spans from economics to psychology is required more than ever before<sup>[30,31]</sup>. In addition, the use of the Urban OS Framework<sup>[32]</sup>, which can be regarded as a movement to standardize the construction of data infrastructure in domestic cases, is being promoted. While this can be seen as a measure to generalize digital aspects through factor analysis of successful cases, in the future, measures to generalize analog aspects, such as infrastructure and human and organizational factors, are required.

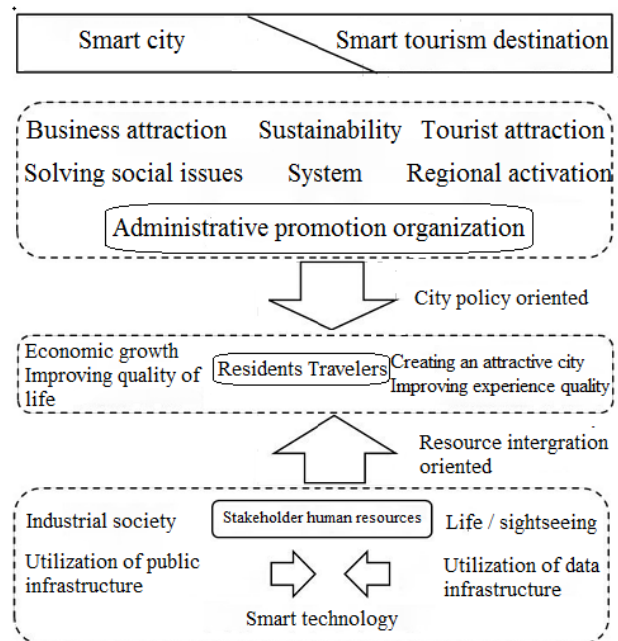
Therefore, this study focuses on cases of regional revitalization in small and medium-sized cities and regions that require both SC and STD aspects, and aims to derive common elements and characteristics through qualitative case analysis, and to extract measurable indicators that can be used as a basis for constructing a quantitative model of the smart development process based on these elements and characteristics. The aim is to identify items that will lead to

measurable indices as the basis for building a quantitative model of the smart development process.

### 3. Framework of the study

#### 3.1. Basic framework of this study

Based on the review of existing studies in 2.1 to 2.3, a basic framework for considering SCs and STDs from a common perspective is shown in **Figure 1**.



**Figure 1.** Basic framework for smart cities and smart tourism destinations.

In order to achieve the common goals of SC and STD in the central part of the vertical direction, the strategies, measures, and institutional designs aimed at by government and promotional organizations at the upper meta-level, and the human resources and stakeholders involved in the projects at the lower general level, will provide services through the use of public infrastructure and data infrastructure empowered by smart technologies. At the lower, general level, human resources and stakeholders involved in the business provide services through the utilization of public infrastructure and data infrastructure empowered by smart technologies. From the perspective of service ecosystem theory, the upper layer can be defined as the meta-service layer and the

lower layer as the service layer.

In the horizontal direction, items that show the relationship between SCs and STDs are positioned, and items that overlap or are common to both are positioned in the central part. For example, in the meta-services layer, the main actor is the promotion organization involving the government, related companies, citizens, and related organizations, and in the SC side, the main policies and strategies are to attract businesses and solve social issues with the aim of economic growth of cities and regions and improvement of residents' QoL, and the institutional design and operation are planned for this purpose. On the STD side, the creation of an attractive town and the attraction of visitors to improve the QoE of travelers are the main goals, and this leads to regional revitalization measures. Common to both is the sustainable development of cities and regions. In the service layer, a variety of business stakeholders, ranging from non-profit to for-profit, including businesses and NPOs, with support from the government when necessary, act as the main actors to provide services to residents and tourists. This will involve both public infrastructure, such as buildings and facilities covering the fields of industry, society, daily life, and tourism, and infrastructure related to data utilization in a variety of forms. Smart technology is expected to contribute to both the QoL of residents and the QoE of travelers through the coordination of infrastructures across fields and the optimization of infrastructure renewal and operation.

Based on the above basic framework, the main characteristic axes of the smart development that promotes SC and STD are “what is the main orientation of smart development” and “what is the main axis of utilization” for smart development. In other words, “orientation of promotion” indicates the axes of top-down orientation of urban policy led by the government and bottom-up orientation through the integration of human resources, etc. led by the private sector. The “main axes of utilization” are the axes of the approach that initially focuses on the utilization of public hard infrastructure as the main driving source and the approach that initially focuses

on the utilization of data and software (including contents) infrastructure as the main driving source. Based on the main characteristic axes of smartization described above, it is expected that the progress of smartization will be promoted with the utilization of public infrastructure and data infrastructure in urban development and service creation from the CPS perspective described in 1.1.

### 3.2. Research target and analysis method

This study aims to analyze a variety of cases that include characteristics of both SC measures and tourism projects aiming at regional revitalization, and to present a common framework for both and a pattern of smart development based on regional characteristics. To verify the common viewpoints of both SC and tourism, we analyze the stakeholders involved, the development process, the aspects of value co-creation and smart development by the parties involved, and the recent linkages between the two projects, using a variety of cases in local cities and regions. Therefore, the study does not focus on cases in large cities, such as typical SC cases in Europe and the United States.

The cases of “Toyama City Smart City,” “Aizu Wakamatsu City Smart City,” “Kino Trainart,” and “Maribor Walk Festival” in the Republic of Slovenia, which aim to improve citizen QoL and attract travelers in medium-sized regional cities, are selected for the study. The reasons for selection are that (1) each case has SC and STD characteristics, and (2) the characteristics of each case are distributed on the characteristic classification described in 3.1. For SCs, information on cities certified by the government is available. Although there is no STD certification, the Smart Resort Concept by METI<sup>[33]</sup> is a good reference.

**Table 1** shows the characteristics of each case study with respect to the main characteristic axes derived in Section 3.1. The “Toyama Smart City” case (hereinafter referred to as TSC) is a successful example of a public LRT led by the government, and the “Aizu Wakamatsu City” case (hereinafter referred to

as ASC) is a representative example of collaboration between the government and an IT company using a data utilization platform. Both cases have proven to be effective in attracting visitors. The “KI-NOKUNI TRAINART” case (hereinafter referred to as KTA) is a case in which a group of artists aiming for regional revitalization collaborated with a railroad company to develop a project in a station and the surrounding area, and influenced the regional revitalization policy of the representative municipality. The “Maribor Walk Festival” case (hereinafter referred to as “MWF”) is an innovative project in which tourism professionals collaborate with public institutions and local experts to reaffirm local resources, enhance the quality of the experience, and convert the experience into content data. Both cases have the potential to work closely with national strategies such as Smart Resorts and Tourism 4.0<sup>[35]</sup>, as well as with local government policies. **Table 1** shows the characteristics of each case study. Each case study has characteristics of SCs and STDs, and is considered appropriate as a case study selection to examine the common perspectives of both SCs and STDs in this study.

**Table 1.** Relative characteristics of the selected cases

Characteristics/ Examples	Orientation for promoting smart		Main axis of utilization for smart	
	Urban policy orientation	Re-source integration orientation	Utilization of public infrastructure	Utilization of data infrastructure
Toyama city smart city	○	△	○	△
Aizuwakamatsu smart city	○	△	△	○
Kinokuni trainart	△	○	○	△
Maribor city walk festival	△	○	△	○

Symbols indicate the degree of the characteristic item. O: Strong, △: Medium to Small

The survey items cover the contents of the main goal in the central part of the framework shown in **Figure 1**, the aspects of the upper meta-service layer and the lower layer to realize this goal, and the characteristics of each case study. All case studies are based on field surveys, unstructured interviews, and additional research using publicly available documents.

The following items were analyzed from both SC and STD perspectives based on the survey content.

- (1) Key players and leadership: human resources, organization.
- (2) Process of progress: vision, institutions, innovation.
- (3) Scope of smart: means of utilization, level of utilization.
- (4) Value creation: aspects of exchange and collaboration, location of co-creation sites.
- (5) Collaboration between the two projects: requests for collaboration, possibility of collaboration.

The survey method consisted of (1) on-site survey, (2) interviews and hearings with key persons and related parties, and (3) post-event verification survey and (4) survey of related publicly available materials. The TSC case study was field surveyed in September 2018 and December 2019, with interviews and interview questions from city hall department officials and interviews with private IT providers. The ASC case study was conducted as part of a research study of engineering industry organizations in January 2018 and A field study was conducted in September 2019, with meetings with the mayor and interviews and interview questioning of public and private SC officials. In both cases, relevant post-event public documents were also included in the analysis: in the KTA case, the research was based on on-site observation and interviews with stakeholders, including six preparation sessions each year and accompanying tours during the event, as well as articles published in each report book; in the MWF case, semi-structured interviews with the responsible person on-site, followed by one semi-structured In the MWF case study, one semi-structured interview with



the person in charge at the site, and subsequent analysis of public documents such as handbooks and SNS information.

## 4. Overview and analysis of the cases

Based on the case studies including time-series perspectives of the four cases selected in the previous chapter, we provide an overview and describe the contents of each of the analysis items (1) to (5) listed in Section 3.2.

### 4.1. Toyama smart city case study (TSC case study)

Since 2001, the city has integrated routes in the city across JR and private railways and LRT (Light Rail Transit; next-generation type) in order to eliminate excessive dependence on vehicles for transportation in the city and reduce expensive road management costs such as snow removal. (Tram system) We have been aiming for “a compact town centered on public transportation” by expanding the transportation infrastructure. As a result, land prices in the central area have turned upward, tax revenues have increased, and the number of public transport users and people moving into residential areas along the railway lines has increased. It was taken up as one of the five advanced cities<sup>[35]</sup>. In recent years, while introducing a data infrastructure, we aim to make the region smarter so that the appropriateness of measures can be shown based on the data. Details will be given to the latest literature, etc. due to the magazine<sup>[36]</sup>. The contents of the analysis based on the outline of this case are as follows.

(1) Practicing town meetings with nearly 200 citizens and government officials who talk about their thoughts on the atmosphere of the street corner where European LRT runs with reference to the overseas case study led by the mayor for the five terms in office. By continuing to promote policies consistently across departments through thorough awareness of the situation and active recruitment of human resources from the deputy mayor to staff, it has led

to certification as an environmental future city (2011) and SDGs future city (2018).

(2) LRT users will increase 1.5 times due to measures such as support for migration to urban areas and measures to curb the opening of suburban shopping centers, based on the monetization policy of local transportation companies by adopting the upper and lower separation (public private management) method. It has led to an increase in tax revenue due to the increase, the bustle of the central area, and the revival of land prices. With the north-south connection of the LRT line passing under the Shinkansen guard, a route connecting castle ruins, museums, canals, etc. has gradually been established, and landscape improvement measures have led to an increase in tourists.

(3) Since around 2017, we have been actively promoting compact city measures to SC measures, and have been promoting data collection, analysis, and utilization of road open data. With the aim of improving the health of the elderly, we have also started motivating the elderly to convert the frequency of use and the number of steps taken into points by introducing a smartphone-specific application. In addition, a society such as a sensor network using LPWA and IoT infrastructure for disaster response such as utilization of traffic and traffic data such as LRT/bus operation, route for children going to and from school, real monitoring of wandering elderly people, and river water level by a project proposed by a private company. From experimental application, we anticipate the development of safe and secure services.

(4) Modeling and remote monitoring/maintenance are being promoted in collaboration with related companies such as lifelines such as water and sewage/gas and road infrastructure. This will reduce administrative costs such as maintenance of surrounding public infrastructure, and aim to improve medical and welfare services by reducing the costs. It is a place where intergenerational exchanges are possible, such as placing a long-term care hot bath facility adjacent to a facility for children. In this way,

the University of Toyama and IT companies have also collaborated to utilize the results of data analysis, and the Toyama model promoted by the industry-academia-government collaboration system has been established.

(5) It is expected that the lively plaza will be more lively than before, such as exchanges between residents who gathered in the city center through measures such as support for new store openings and outing commuter passes. This also leads to the charm of the area including the surrounding Toyama castle ruins and museums. Here, by grasping the flow of people from the traffic data and the situation of the busy open space in the center, it will be reflected in the further promotion of LRT use and the patrol route of tourists, and for the next generation mobile service MaaS. Cooperation between SC measures and prefectural tourism projects centered on Tateyama tourism, such as connection, is also being considered.

#### **4.2. Aizu Wakamatsu city smart city case study (ASC case study)**

Starting with “electricity visualization” services for energy conservation, such as the introduction of electricity smart meters and HEMS, as an opportunity to support reconstruction after the 2011 earthquake, and referring to Estonia's e-government initiatives, the SC is promoting a community-led model for citizen data utilization, etc., a pioneer in a country with a population 1/1000th that of Japan. The SC is now at the stage of building a track record of providing services to citizens and businesses with a similar aspiration<sup>[32]</sup>. In recent years, it has become a representative example of the “Urban OS,” a digital standard model for SCs being developed by the Cabinet Office, and has begun to be deployed in other cities, such as Kashihara City, Nara Prefecture. The utilization of data infrastructure is characterized by efforts to directly link findings from data analysis and portal functions to services<sup>[32]</sup>.

(1) Under the aspiration for regional revitalization through “IT utilization for reconstruction” of the

mayor with IT expertise who took office after the earthquake, a smart city council involving public organizations can be promoted, with local offices of IT consulting firms and local universities initially taking the lead, along with local public organizations participating in the direction of attracting businesses and promoting employment of young people. The system is structured in such a way that it can be promoted by the Smart City Council involving public organizations.

(2) With the vision of “creating high value-added industries and fostering human resources” and “a city chosen by people”, a shift in the mindset of citizens and human resources is underway from the initial public assistance-centered values to mutual aid and self-help. The Smart City Council, chaired by the director of a local hospital, is aiming for advanced utilization of medical and lifestyle data, taking the scope of future data utilization one step beyond public data such as administrative data. Aiming to connect to business activities while making efforts to increase the level of understanding among citizens.

(3) The expansion of the administrative service system, including the improvement of the access rate of “Aizu Wakamatsu Plus,” a digital infrastructure for citizens using smartphones and cloud computing across eight domains, is the base of the city's smartening. AiCT, an intelligent building to be completed in 2019 as an industrial infrastructure (AiCT), is already occupied by major companies and will provide a place for free social experiments where nearly 250 employees can study mobility and medical data utilization businesses. The building also contributes to the establishment of local human resources with expertise in data science through collaboration with the University of Aizu and other means.

(4) The project will be promoted while enhancing the acceptability of local stakeholders through repeated dialogues at the Smart City Council and forums with citizens (once every three months), and the administrative costs saved by the computerization of administrative services described in will be

used to further expand the SC promotion organization and contribute to the enhancement of preventive medical services through the reorganization of medical facilities. The administrative costs saved by the computerization of administrative services can be allocated to the further expansion of the SC promotion organization.

(5) The promotion of “Aizu-Wakamatsu Plus” from 2015 will lead to the reorganization of the Civic Affairs Department and the Health Care Department into the Smart City Promotion Department by downsizing them. The “VISI+AIZU” function aims to increase the number of tourists and enhance satisfaction through the “Digital DMO,” a tourism promotion mechanism that integrates not only the city but also the public and private sectors in the Aizu region. The data will also be provided to the operators. Utilize intelligent web functions that reflect the preferences of visitors in order to promote stay-and-go type tours that enhance the value of the experience, as well as landfall type tours that lead to a more connected population. Realistic collaboration with local tourism organizations is being considered.

### 4.3. Kinokuni Trainart (KTA case study)

Kinokuni Train Art (KTA) is a project launched in 2014 that aims to revitalize the local community and attract visitors by focusing on the art that will be developed in and around more than 20 station buildings and stations in nine municipalities along a 100-km stretch of the JR Kinokuni Line, and the art train that will travel around these stations<sup>[37,38]</sup>. This is a unique project in Japan and abroad that utilizes highly public railroad infrastructure over long distances. Tanabe City, which is the operator of the project, and the adjacent resort town of Shirahama are also aiming to become smart cities and smart resorts<sup>[33]</sup>. In recent years, the city has been promoting the permanent installation of artworks that link local resources and content data, not only in station buildings and along train lines, but also “from the station to the town.

(1) In response to a call for “regional revitalization through art” by a female artist who had returned

to her hometown from her creative activities in Paris, urban and local artists who agreed with the purpose of the project gathered together and initially held a budding event at the site of the local library. Inspired by the activities of both companies, local residents, students, and local government also understood the importance of “for the station building in our community” and increased their awareness through the creation of artworks, station building cleaning and renovation, and participation in workshops and other activities.

(2) With the vision of “creating a lively community through exchanges among nine towns and attracting visitors from outside,” the project was expanded to station buildings and art trains along a 100 km section of the JR Kinokuni Line, then to 130 km along the line and 12 municipalities, and marketing was conducted in Kyoto, Osaka and Kobe for visitors along the line. The JR company also sold special excursion tickets for limited express and other trains, and tourism associations in each area held events to attract visitors to the shopping areas around the stations. Under the executive committee (in the Tanabe City Chamber of Commerce), the event has received support from NPOs and educational institutions, and has expanded to include local businesses and producers, and continues every year (suspended in 2020 due to the Corona disaster). The number of participants has expanded to include urban contemporary art fans and general visitors.

(3) Tanabe City and Shirahama Town, which are the management entities of the KTA case study, have been working on smart initiatives such as exchanges with Aizuwakamatsu City and the Smart Resort concept (hospitality-type welcome signage and check-in by means of face recognition and automatic payment). In recent years, KTA has been aiming to develop experience tour services that are linked to railroad business, such as “from station to town” art trains, “window art” from regular railcars, and “local dive” guided walks that visit representative spots along the railroad line. This will be supported using social networking services (SNS) to communicate with local and urban areas, and by exchanges among

the main players in this field. Although the service has not yet been linked to the smart phone payment system being tried by local tourism associations, the permanent installation and characterization of artworks (e.g. penguins) and the accumulation and utilization of art content data are in progress.

(4) Cooperation among organizations and employees beyond the JR district and other areas of control has progressed, and cooperation and exchange in the design of art trains and the creation of station building artwork by artists during the preparation period has expanded to include residents and children. Cooperation and interaction with residents and children were also extended to the design of the art trains and the creation of station building artwork by the artists during the preparatory period. The unmanned station building and the square in front of the station were also utilized through this project. As a result, local wood resources and food culture were utilized, and events were held with an awareness of tsunami disaster prevention. In this way, the art project along the rail line has led to the integration of resources, creating “connections that transcend gaps through art” that transcend the boundaries of local administration, culture, and business.

(5) This project showed new possibilities for collaboration among regional leaders beyond the boundaries of the municipalities along the rail line. The creation of the station building artwork, the train trip, the related events, and the fact that the artwork went out from the station building to the community have created a sense of trust and joint experience between the artist/operating staff, local supporters, local government, JR employees, tourist associations, and local companies, which had not existed before, and have become a trigger for new collaboration. The creation of service content from the works has been reflected in the plans of the tourism associations and the product menus of the businesses. In addition, the role of SNS, which differs from that of urban areas, is to share information in a “know-who” manner and to strengthen awareness of the di-

vision of roles. The SNS serves as a base for the integration of human resources for the smart development of the region.

#### **4.4. Maribor walk festival (MWF case study)**

In this case, which is being promoted in Maribor, the second largest city in the Republic of Slovenia, the traditional tourist guide walk was removed and a project aimed at regional revitalization and creative tourism was launched, with the city of Maribor and the surrounding countryside as the main venue<sup>[39]</sup>. The city participates in pilot activities through the local community of Tourism 4.0, a national strategy aimed at making tourism in Slovenia smarter. Rajzefiber, a tourism producer financed by the EU and the organizer of this MWF, is also continuing to teach digitization skills for related companies.

(1) Two men and women who acted as local guides, triggered by a request from the hotel, unearthed experts with deep knowledge of the local resources of the town and provided guides with the aim of “molting from the traditional tourist guide walk”. Expanded to more than 20 people as a leading local expert. Aiming at “experience local, try daily life”, “learn skills such as traditional cooking”, “change knowledge as well as memories”, research walk (literature, creative tourism, industrial heritage, origin of town) The hills are also implemented. In 2019, 30 free walks have been held in 6 days and are being expanded to the surrounding area. By co-creatively producing various tour menus, we are leading to individual paid tours.

(2) Operated by various NPOs, university libraries, city tourism associations, and Rajzefiber with the vision of “a beautiful town with a history since the 13<sup>th</sup> century, but now a rather boring town, but discover many hidden stories”. Labs are operating with increased cooperation. Expanded to a variety of guide walks targeting the historical heritage and historic sites of the city, as well as natural and cultural resources and local resources such as characteristic stores and markets. Furthermore, we

are trying to accumulate and expand service contents and commercialize them while enhancing the characteristics of creative tourism, which autonomously develops menus according to the theme of interest of travelers.

(3) MWF collaborates with various NPOs, university libraries, and city tourism associations to “city streets (wine-derived, oldest trees, etc.), unique shops, markets, underpasses (warehouses, factory ruins in the Nazi era). We will promote digitization as tourism content such as “Prison Site (Literary Residence)”, and create a ripple effect on the entire city and surrounding areas through SNS, web transmission, and regular online broadcasting with local citizens. There is. It also triggered the renovation of the historic but dilapidated facility infrastructure, leading to the improvement of the Civic Pride. In addition, the organizer, together with the national university entrepreneurship support team Locals from Zero, continues to hold workshops for participating businesses to teach the knowledge necessary for digitization of ICT and entrepreneurship.

(4) Improve yourself by interacting with guides from mere memories of travelers, such as experiencing local daily life and learning traditional dishes, and visiting old and new infrastructure such as historical buildings and facilities, literature and industry, it has also developed into a research tour of the origin and heritage of the town. With the lab facility, which is also subsidized by the EU, as a place of collaboration, it is developing into creative tourism in which design thinking experts support new routes and prototypes are created by citizens and other related parties on their own.

(5) The cooperation of the city and tourism associations was not enough because it was an original activity at the beginning. Cooperation and cooperation of public institutions through media and online reports that introduce a value co-creation approach that provides a place for interaction and expansion of relationships with experts and travel-related people who are familiar with local resources that are different from the conventional ones. Has evolved into.

This is a bottom-up approach from the citizen side aiming to realize smart tourism under Tourism 4.0 in the country, and it is a new smart business model that commercializes unique experience value into an online marketplace. Aiming for development<sup>[40]</sup>.

## 5. Considerations

### 5.1. Consideration of commonalities among the cases

For each of the items analyzed in Chapter 4, the main points of comparison and discussion are summarized in **Table 2**. In this section, we focus on the commonalities among the cases from the viewpoint of innovation toward smart tourism cities (STC).

The commonality in the analysis item (1), “Main players and leadership” (human resources, organization), is that it was essential to secure innovative and continuous leadership with a passion for regional revitalization and partners to support this leadership. In the TSC and ASC cases, where the promotion of smart development is oriented toward urban policy, the enthusiasm of the local leaders and the presence of administrative personnel, IT company leaders, and university faculty members who can support them are significant. In the KTA and MWF cases, which are resource integration-oriented, it was essential to involve local actors through the aspirations of local leaders and the cooperation of other partners. The promotion organization is discussed in section 3) of the analysis.

The commonality in the “development process” (vision, institutions, and innovation) described in the analysis item (2) is the creation of new innovative projects that transcend the barriers of existing organizations by clarifying the vision and gradually creating rules and institutions for public-private partnerships. In the TSC and KTA cases, where the main axis of utilization for smart infrastructure is the use of public infrastructure, the project overcame the existing barriers through the improvement of business incentives for railroad companies. The ASC and

MWF cases, which are based on the use of data infrastructures, have developed more advanced services that involve more creativity than before, aiming to foster and integrate the bearers of such services.

**Table 2:** Summary of comparative study of each case study

Summary of features and considerations Each case (Abbreviation)	Characteristics of Smartization		Comparative consideration for each analysis item			
	Promotion orientation	Main axis of utilization	Main players and leadership	Progress process	Scope of smartening	Value creation
Toyama city Smart City (TSC case study)	Urban policy initiative	Utilization of public infrastructure	Development of administrative human resources to support the enthusiasm of the long-term chief for “the atmosphere of the street corner where LRT runs like Europe” The chief’s enthusiasm for “reconstruction and IT utilization”	By introducing a publicly-owned private system for railway companies, we will expand public transportation routes, revive the bustle, and attract customers.  Fostering human resources who will be responsible for revitalizing the industry	As a result of the compactification policy, progress is being made in utilizing data infrastructure such as road open data and progress in traffic and traffic data.  To attract businesses to build a dedicated building that utilizes the data infrastructure and lead a demonstration experiment as a shared infrastructure	Reduce administrative costs for public infrastructure maintenance by making it smarter and link multiple services. To improve the cooperation of citizens  Enhancing services such as medical welfare and full-scale utilization of data infrastructure for private businesses by reducing administrative costs through smartening
Aizuwakamatsu Smart City (ASC Case Study)	Urban policy initiative	Utilization of data infrastructure	IT utilization and close cooperation with IT company leaders and university officials	Through activities to attract tourists to local governments along railway lines, cooperation with local tourism and educational institutions and projects that go beyond the boundaries of conventional administration and jurisdiction	While maintaining railway infrastructure cooperation, through hands-on tour services and content creation through art, “from station to town”, to regional cooperation.	To improve the possibility of cooperation between local leaders and public institutions by taking advantage of the characteristics of the art festival
Ki no Kuni Tray Nart (KTA Case Study)	Resource integration initiative	Utilization of public infrastructure	Young female artist’s passion for “regional revitalization through art” and her ability to involve other artists and railroad companies	Aiming to revitalize the region, discovering regional resources, creating service content, and developing creative entrepreneurship and services	Create rich content by local experts, build influential spots in the town, renovate facilities, and improve entrepreneurship and IT skills.	From the traditional passive tourism business activity called Guide Walk the leader of autonomous town development through creative business
Maribor Walk Festival (MWF case study)	Resource integration initiative	Utilization of data infrastructure	The desire to “break away from traditional guided walks” and the ability to produce events that involve local experts and public institutions			

In the analysis item (3) “Scope of smartening” (utilization means, utilization level), we aim to make various smartizations that take advantage of the characteristics of the region according to the situation of the local service eco-system. In each case, measures are implemented in both directions, from analog to digital, and from digital to analog, such as the integration of human resources and the means of utilization including public infrastructure and data / content infrastructure. In the TSC case, the utilization of public infrastructure preceded, and further progressed to the utilization of data infrastructure. In the ASC case, the data infrastructure constructed in advance was constructed by constructing a dedicated building as a shared infrastructure in order to attract businesses. We are promoting business collaboration. In the case of KTA, while maintaining cooperation with public infrastructure, cooperation with the local community is promoted more than before, and in the case of MWF, it leads to the renovation of facilities and support for entrepreneurship as well as the rich content by experts.

The common point of “value creation” (aspect of exchange / collaboration, location of co-creation) in (4) of analysis item is value co-creation that leads to promotion of exchange / collaboration between actors and establishment of business model across citizens. Efforts are being made to build a place for process and co-creation. In the TSC and ASC cases, we will improve opportunities to enhance single services such as medical welfare, cooperate with multiple services, and increase the weight of private businesses by reducing administrative costs through top-down administration and smarter citizen services. In the KTA and MWF cases, by setting up a place of creation, we are creating opportunities to increase the acceptance of citizens and local communities through creative activities and to become autonomous players.

## 5.2. Characteristics of the cases and factors of success

This section discusses important points and measures for the promotion of Smart Tourism City

(STC) based on the comparative discussion in items (1) to (4) in Section 5.1 and the discussion on the “linkage of the two projects” (requests for linkage, possibility of linkage) in item (5) of the analysis. In the analysis item (5), “Linkage of the two projects” (demand for and potential for linkage), various patterns of demand for and potential for linkage can be recognized according to the various conditions described in the analysis items (1) to (4).

In the TSC case (urban policy-oriented x public infrastructure utilization type), the improvement of urban attractiveness through the development of LRT public infrastructure and surrounding facilities, and the utilization of data centered on mobility services such as MaaS associated with such infrastructure are expected to have potential as a link to tourism projects in the entire prefecture that hosts Tateyama tourism. In the ASC case study (urban policy-oriented x data infrastructure utilization type), the data infrastructure utilization demonstrated in the city of Tateyama is being deployed to promote tourism in the entire Aizu region. The digitalization of the DMO, which strengthens cooperation with tourism organizations, contributes to the promotion of a stay-and-go type of tourism that enhances the value of the experience, as well as a landing-type tourism that leads to a related population. In both cases, it is the SC promotion organization that leads the collaboration.

Based on the above discussion and the related comparative study in 5.1, the “urban policy-oriented type” in terms of STC promotion orientation is more likely to be a top-down type of measure that takes advantage of regional characteristics (a1 was added as a symbol, and the same applies hereafter). The key points for STC promotion in the “urban policy-oriented” case are top-down measures that take advantage of local characteristics (a1, used in **Figure 2** in 5.3 below) and the promotion of urban development that utilizes public resources (a2).

In the KTA case (resource integration-oriented x public infrastructure utilization type), the integra-

tion of human resources of local stakeholders, including those involved in tourism, centered on the railroad infrastructure, and the creation of service contents through the art creation process and guided walks of local resources have an impact on the planning of tourism organizations and the product menus of related businesses. In the MWF case study (resource integration-oriented x data infrastructure utilization type), the method of co-creatively designing tourism menus with experts, citizens, and libraries and the accumulation of service contents have a new impact on existing businesses and lead to the development of entrepreneurial and IT skills for utilizing local resources. This will lead to the development of human resources who will be responsible for smart policies.

From the above discussion and the related discussion in 5.1, it is considered that in the “resource integration-oriented type,” the leader's aspiration for regional revitalization and alliance with partner organizations (b1), and the synergy effect between the enrichment of regional resources and service contents (b2) are important points for STC promotion.

From the discussion of the above four cases, similar points can be drawn from the viewpoint of the main axis of utilization of smart technology for STC promotion. In other words, based on the discussion of the TSC and KTA cases, the key points of the “public infrastructure utilization type” are the linkage of public infrastructure with local resources to revitalize the areas along the lines and bases (i1) and the awareness of utilization of public infrastructure as a shared resource and the improvement of local attractiveness (i2). In addition, based on the discussion of the ASC and MWF cases, it is considered important for the “data infrastructure utilization type” to promote and expand business collaboration using the data infrastructure (j1) and to create a virtuous cycle between the improvement of citizens' acceptance of the data infrastructure and its utilization as a service (j2).

### **5.3. Smart tourism details of city promotion proposed framework**

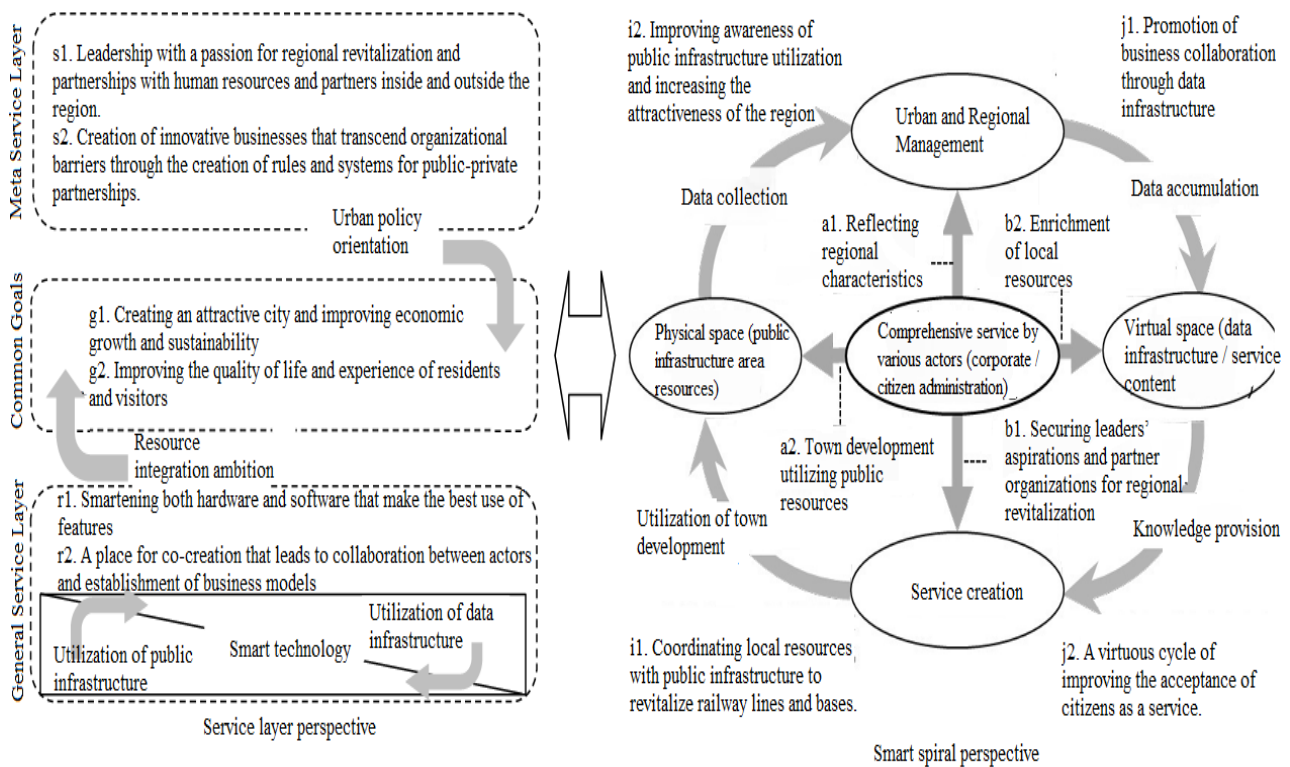
**Figure 2** shows a proposed detailed framework for envisioning a Smart Tourism City (STC) based on the commonalities between SC and STD that have been examined and extracted in the discussion up to the previous section, as well as the diversity and patterns of approaches based on the characteristics of each case study.

The left half of **Figure 2** inherits the basic framework described in 3.1 from the viewpoint of the service layer, and the common points for promoting STC of the consideration results are the “meta service layer” and the “general service layer”. It is positioned and expressed as a “common goal”. There are urban policy-oriented and resource integration-oriented in the smartization aiming at the common goal, and the thick arrow indicates that both are gradually complementing each other in one case. “General service layer”.

Of the above detailed frameworks, the service layer perspective shows the components of innovation to achieve the goals associated with STC promotion and the macro direction toward smartening, and the smartening spiral perspective shows the utilization of public infrastructure or It shows how the two complement each other as the spiral gradually progresses regardless of which of the data infrastructure utilization precedes. It will be possible to provide a perspective that grasps the current situation and envisions future directions while mutually using both perspectives.

For example, in the case of Supercity 2021<sup>[41]</sup>, which is expected to make progress in the future, we are aiming for social implementation with the aim of making it smarter, aiming for overall optimization across multiple service areas in the target area. Of these, the detailed framework is applied to the Kaga City case and the Nanki Kumano area case.





**Figure 2.** Proposal of detailed framework for promoting smart tourism city.

In the case of Kaga City, it can be said that the city envisions the promotion of STC, which corresponds to the “urban policy-oriented” × “data infrastructure utilization” type, under the slogan of “revitalization of a tourist city through the introduction of the e-Residency (e-Kaga Citizen System)”. In other words, it is a top-down approach by the mayor to create a tourist city with one million e-Kaga citizens in order to overcome the dispersion of the base area due to the merger and the accelerated decline in the number of visitors due to the Corona disaster. The city will also seek to improve medical services through an information bank, rather than relying on the opening of the new Hokuriku Shinkansen station. Through these efforts, the project aims to improve the quality of life of residents, and to encourage long-term stays, such as hot-spring cures and work vacations, as well as migration and industrial concentration.

In the case of the Nanki-Kumano region, Wakayama Prefecture, Susami Town, and Nanki-Shirahama Airport are collaborating to promote STC,

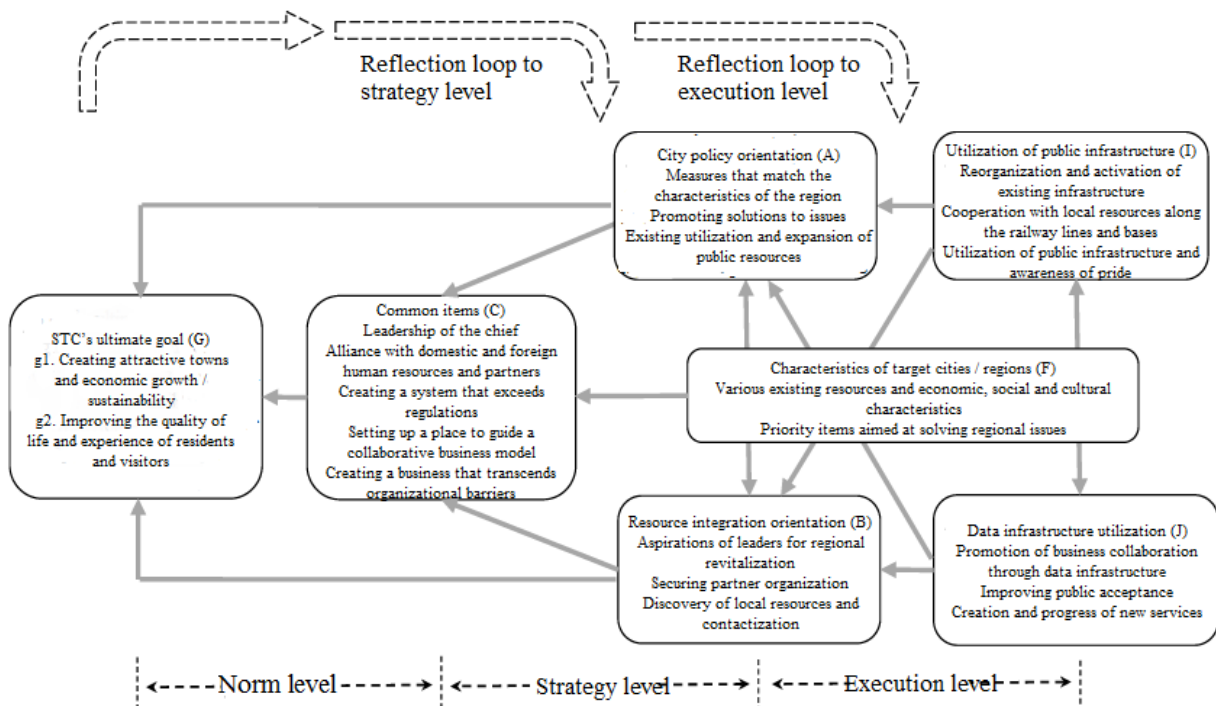
which is equivalent to “resource integration-oriented” × “public infrastructure utilization” under the theme of “Technology × People × Nature × Culture 'Future Tourism Town'“. This is a “resource integration-oriented” and “public infrastructure utilization” type of STC. In other words, although it is a super-aging society with an aging population rate of over 47% and is considered one of the top vanishing cities, it has a frontier spirit that has produced many overseas immigrants, daily life resources that allow people to live freely, natural resources such as national parks and geoparks, cultural resources such as Kumano Kodo, and a strong presence of IT engineers due to its proximity to Haneda Airport (90 minutes). This type integrates regional resources such as proximity to Haneda Airport (90 minutes from Haneda Airport) and recognition as an advanced work location for IT engineers and IT companies. The airport is also expected to serve as a site for social experiments by a public-private partnership community that has already established face recognition and payment services using the airport infrastructure for “airport-based regional development” and to spread to

the southern part of the prefecture.

Both cases aim to “create an attractive town and achieve economic growth and sustainability” (g1) and “improve the quality of life and experience for residents and visitors” (g2). As described above, the detailed framework for STC promotion proposed in **Figure 2** includes the service layer perspective and the smart spiral perspective, which are important points of abstraction and their interrelationships necessary to explain the promotion of STC-related cases. In other words, this detailed framework shows the possibility of expressing findings on STC promotion from both the service layer perspective and the spiral perspective, which includes smart measures that reflect regional characteristics.

#### 5.4. Considerations for quantitative modeling of STC development process

Based on the factors qualitatively extracted through the four cases and the two cases, a hypothetical model of the process of progress toward a community-activated STC is shown in **Figure 3**. The relationship between the items to derive important indicators for the development process is shown. The items listed in each block represented by squares are extracted items that should be further focused on and materialized as measurable indicators based on the important points in **Figure 2** and the results of the case study analysis. The arrows represent causal relationships in the STC progression, which were qualitatively estimated based on the case study analysis. The four blocks (A, B, I, and J) in **Figure 3** indicate that the characteristics (F) of the target city/region are reflected.



**Figure 3.** Hypothetical model of the process of progress to regional activation type STC.

Each item is extracted from the six cases, and is assumed to be further extended by analyzing other regional revitalization cases that show aspects of STCs. We believe that each item can be extended to the construction of a quantitative model based on this

model by selecting more specific measurable indicators, for example, by referring to published data such as smart city policy documents and international standards, or by utilizing the results of related research, etc., and by using new analysis data such as questionnaires<sup>[42]</sup>.

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For example, for the final goal (G) of STC in **Figure 3**, it is assumed that indicators reflecting the results of future research through macro-model research, etc., with an awareness of “Refinement of indicators for satisfaction and quality of life”<sup>[50]</sup>, will be used as references. In addition, for “various existing resources and economic, social, and cultural characteristics” in “characteristics of target cities and regions” (F), core indicators in the international standard ISO37120 (Guidelines for Sustainable Cities and Communities Evaluation Indicators Standard, established in 2014) can be referenced<sup>[43]</sup>. The “priority items for solving local issues” in F can be abstracted or concretized by comparing them with urban and regional issues classified in consideration of the 17 goals of the SDGs<sup>[51]</sup>, etc. Furthermore, it is expected that the refinement of indicators in the common framework of SC and STD of this study will be considered, including the study of the trial status of management indicators for STD<sup>[45]</sup>.

As described above, in STC at the regional revitalization level, we envision a path to quantitative modeling of the progress process toward the final goal of STC through the creation of services by smartening that reflects regional characteristics and major regional issues can do.

The detailed framework proposed in 5.3 will lead to the provision of basic knowledge and sharing means for various stakeholders to collaborate in a cross-cutting manner to promote STC. For example, if a detailed innovation architecture<sup>[45]</sup> is created from the viewpoint of the service layer, the “norm level” and “possibility of cooperation” regarding the

“leaders and organizations”, “systems”, “means of use”, “possibility of cooperation”, etc. When envisioning each level of “strategy level” and “execution level”, it can contribute to sharing and examination beyond the boundaries of administration and citizens, affiliated organizations, and service application fields. Also, by associating the components of the service layer with each node or link from the smart spiral perspective and looking at the progress over time, the progress of the elements of each service layer could be expanded to the roadmap<sup>[46]</sup>.

The lower part of **Figure 3** shows the position of each block at each level of “norm level”, “strategy level”, and “execution level” in the STC progress process described above. Also, from the perspective of the smart spiral, the thick arrow at the top of **Figure 3** indicates that the achievement status of the final goal (G) is reflected in the status of strategic and execution-level measures / projects, regional characteristics of F, and problem items. It is shown by. Based on this quantification model, after refining appropriate indicators for regional activation type cases, cluster analysis of the characteristics of cities / regions in multiple cases and the items extracted in this study, etc.<sup>[47]</sup> It will lead to the categorization of smart measures aimed at STC and the examination method of smart promotion measures that suit the regional characteristics.

In this study, each case study was analyzed and discussed in terms of two characteristic items: “orientation for promoting smart” and “main axis of utilization for smart”. These two items alone are still insufficient to capture the full picture of STC, and a more comprehensive survey and analysis using other characteristic items is needed. In relation to the “resource integration-oriented” type of the former characteristic item, the type of citizen participation varied depending on the region and situation. In the latter characteristic item, the “data infrastructure utilization” type is expected to utilize more diverse data and information than the classification of data and contents. In this study, we did not go into the details of the technology, but focused on organizing the macro perspective.

In general, abstraction through comparative verification of case studies requires attention to “cultural essentialist risks” in extracting the social and cultural characteristics of the case studies, depending on the level of analysis<sup>[48]</sup>. It should be noted that in this study, when extracting the characteristics of a single case, we also pay attention to such risks by focusing on the context of the case and the process of smart development, paying attention to the internal differences that accompany temporal changes.

## 6. Conclusion

In this study, we presented a common framework for smart cities (SC) and smart tourism destinations (STD) with the aim of aligning the frameworks of smart city measures for local cities with regional revitalization-oriented tourism projects. For that purpose, we conducted a survey and analysis of four cases with various characteristics regarding the intention to promote smartization based on the broad meaning of smartization including smart technology and the main axis of smartization utilization, and provided a macro explanation and description of the aspect. As a result of comparative consideration, to promote Smart Tourism City (STC) that integrates the concepts of both STD and SC, aiming to improve and create the quality of life of citizens and residents and the quality of experience for visitors and travelers. A detailed framework has been proposed.

In the detailed framework, the discussion results of the four cases were abstracted, and the direction and pattern of smartening that reflected the common vision, innovation goals, and regional characteristics in STC were positioned on the service layer. We also extracted the perspectives of smart measures that link the management of cities and regions and the creation of services to achieve the synergistic effect of public infrastructure, regional resources, data infrastructure, and service content that are advancing on the spiral of smartening.

In addition to applying this framework to the description of the current Super City application case, we present a model of the relationship between the final goal of smartening and the characteristics of the

region and the items that lead to indexing regarding the process of progress to the regional activation type STC. did. The direction of the study, such as embodying it by collating it with the published evaluation indexes, was shown, and the path to quantitative modeling of the progress process was shown.

Now, the research results are based on the case of regional revitalization, but now that we are in the dawn of a smart society or a partial transition period, we will be able to provide insights on the appropriate implementation of future smart measures. In order to obtain this, the results of this research are the basis of research aimed at quantitative analysis and detailed categorization of various cases.

## Conflict of interest

The authors declare no conflict of interest.

## References

1. Yutaro N, Takashi O, Fumiya A. Special commentary smart city: Co-creation of town functions and culture in “Smart city: Co-creation of town functions and cultures. *Seismology Web Magazine*; 2020 [cited 2021 Jan 10]. Available from: <https://magazine.serviceology.org/2020/04/13>.
2. Supercity website [Internet]. 2020 [cited 2021 Jan 10]. Available from: <https://www.kantei.go.jp/jp/singi/tiiki/kokusentoc/supercity/openlabo/supercitycontents.html>.
3. Shoji M. Regional value co-creation: A service ecosystem: A perspective. *Journal of Seismology* 2017; 4(3): 18–23.
4. Murata H, Nakamura K, Shirahada K. Knowledge co-creation road mapping for future industrial visions: Case study of smart infrastructure. *Foresight and STI Governance* 2021; 15(2).
5. Nakamura K, Sakamoto H, Krizaj D. Social value creation in art-related tourism projects: The role of creative project actors in diverse national and international settings. *Academica Turistica* 2017; 10(2): 191–203.
6. ENAA. New industry research subcommittee FY2019 report—Research study on smart social infrastructure and engineering. Tokyo: Engineering Advancement Association of Japan; 2020.
7. Uzawa H. Social common capital. Tokyo: Iwanami Shinsho; 2000.
8. Nam T, Pardo TA. Conceptualizing smart cities with dimensions of technology, people, and institutions. In *Proceedings of the 12th annual international digi-*

- tal government research conference: Digital government innovation in challenging times; 2011: 282–291.
9. Yamashita M. Special issue on “Innovation creation in public services innovation creation in public services key words for innovation creation in public services. *Journal of Seismology* 2015; 2(1): 2–3.
  10. Buhalis D, Amaranggana A. Smart tourism destinations. In: Xiang Z and Tussyadiah L (editors). *Information and Communication Technologies in Tourism 2014*. Dublin: Springer. 2014. p. 553–564.
  11. Kawamura H, Yamamoto M, Suzuki K, et al. Tourism informatics and tourism information society of Japan. *Journal of Seismology* 2015; 1(4): 36–41.
  12. Avila L (editor). *Smart destinations: XXI century tourism*. The ENTER2015 Conference on Information and Communication Technologies in Tourism; 2015 Feb 4–6; Lugano, Switzerland.
  13. Kimita K. On the special issue “co-production for solving social issues”. *Journal of the Seismology Society of Japan* 2018; 5(3): 2–3.
  14. Makiguchi T. *The philosophy of value*. Tokyo, Japan: Seikyo Press; 1964.
  15. Vargo SL, Lusch RF. Institutions and axioms: An extension and update of service-dominant logic. *Journal of the Academy of Marketing Science* 2015.
  16. Vargo SL, Wieland H, Akaka MA. Innovation through institutionalization: A service ecosystems perspective. *Industrial Marketing Management* 2015; 44(1): 63–72.
  17. Russell B, Eileen F, Robert VK. Qualitative consumer and marketing research. In: Tsuyoshi Matsui (translator). Tokyo: Chuokeizai-sha Holdings, Inc.; 2016.
  18. Albino V, Berardi U, Dangelico RM. Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology* 2015; 22(1): 3–21.
  19. Fujii K, Takeshi S, Takehiro T. Smart city formation in Japan. *Process and Future Challenges*, *Journal of Development Engineering* 2015; 35(2): 183–192.
  20. Smartcity [Internet]. 2019 [cited 2021 Jan 10]. Available from: <https://www5.cao.go.jp/keizai-shimon/kaigi/special/reform/committee/20191009/shiryoku4.pdf>.
  21. SIP. Smart city reference architecture [Internet]. 2020 [cited 2021 Jan 10]. Available from: <https://www8.cao.go.jp/cstp/stmain/20200318sip-architecture.html>.
  22. Gretzel U, Sigala M, Xiang Z, et al. *Smart tourism: Foundations and developments*. 2015 [cited 2021 Jan 10]. Available from: <https://link.springer.com/article/10.1007/s12525-015-0196-8>.
  23. Maeda I. *New modern tourism review*. 3<sup>rd</sup> ed. Tokyo: Gakubunsha; 2019.
  24. Meijer A, Bolívar MPRB. Governing the smart city: A review of the literature on smart urban governance. *International Review of Administrative Sciences* 2016; 82(2): 392–408.
  25. Boes K, Buhalis D, Inversini A. Smart tourism destinations: Ecosystems for tourism destination competitiveness. *International Journal of Tourism Cities* 2016; 2(2): 108–124.
  26. Ivars-Baidal JA, Hernandez MG, Miguel SM (editors). *Integrating overtourism in the smart tourism cities agenda*. Enter2020 Conference; 2020 Jan 8–10; Guildford.
  27. Ceylan S (editor). *Bodrum “As a smart tourism destination: Vision and challenges”*. ENTER2020 Conference: Responsible eTourism; 2020 Jan 8–10; Guildford, UK. 2020 [cited 2020 Feb 15]. Available from: <http://www.airth.global>.
  28. UNWTO. *UN World Tourism Organization 1988 Annual*. 1988 [cited 2020 Feb 20]. Available from: <https://www.e-unwto.org/doi/book/10.18111/9789284408467>.
  29. Krizaj D, Bratec M, Kopic P, et al. A technology-based innovation adoption and implementation analysis of European smart tourism projects: Towards a Smart Actionable Classification Model (SACM). *Sustainability* 2021; 13(18): 10279.
  30. Hoback SK. Well-being-oriented value co-creation and its analytical perspective. *Journal of Seismology* 2018; 1(1): 1–9, 20.
  31. Deguchi A. Initiatives and challenges of cooperative creation of humanities and science on smart cities. *Academic Trends* 2020; 7: 44–49.
  32. ASC [Internet]. [cited 2021 Jan 10]. Available from: <https://aizuwakamatsu.mylocal.jp/detail?wid=44320118&cid=0&pf=re>.
  33. Ebihara J, Nakamura S. *SmartCity 5.0: Urban OS to Accelerate Regional Development*. Japan: Impress Corporation; 2019.
  34. Ministry of Economy, Trade and Industry. *Smart Resorts Handbook*. 2019 [cited 2021 Feb 20]. Available: [https://www.meti.go.jp/policy/mono\\_info\\_service/mono/creative/downloadfiles/fy31/handbook2.pdf](https://www.meti.go.jp/policy/mono_info_service/mono/creative/downloadfiles/fy31/handbook2.pdf).
  35. Tourism4.0. 2021 [cited 2021 Jan 10]. Available from: <https://tourism4-0.org/>.
  36. TSC [Internet]. 2020 [cited 2021 Jan 10]. Available from: [http://www.city.toyama.to-yama.jp/data/open/cnt/3/13217/1/T\\_OYAMA-JP.pdf](http://www.city.toyama.to-yama.jp/data/open/cnt/3/13217/1/T_OYAMA-JP.pdf).
  37. Toyama City Business Concept Study Group. *Toyama-type compact city: Concept and practice*. Tokyo: Institute of Advanced Education; 2020.
  38. KTA. 2019 [cited 2021 Jan 10]. Available from: <http://trainart.jp/2019>.
  39. Nakamura K, Hiromoto N, Nakayama H. An attempt of SDL-like description of hospitality-based value co-creation management (Report 4)-regional revitalization by KINOKUNI TRAINART from a service case study. *Proceedings of the 4th Domestic Conference of the Japan Society for Service Research*; 2016.

40. MWF [Internet]. 2021 [cited 2021 Jan 10]. Available from: <https://www.rajzefiber.si/en/>.
41. LFZ [Internet]. 2021 [cited 2021 Jan 10]. Available from: <https://www.localsfromzero.org/>.
42. Supercity [Internet]. 2021 [cited 2021 Jan 10]. Available from: [https://www.chisou.go.jp/tiiki/kokusentoc/supercity/koubo/supercity\\_broucher.pdf](https://www.chisou.go.jp/tiiki/kokusentoc/supercity/koubo/supercity_broucher.pdf).
43. Hitachi University of Tokyo Laboratory. Proposal for the realization of sustainable smart cities: Five key factors and 15 supportive measures by the government. 2020 [cited 2021 Sep 1]. Available from: [http://www.ht-lab.ducr.u-tokyo.ac.jp/wp-content/uploads/2021/09/07a703c580bfbdd8db6a6f8\\_29664754c.pdf](http://www.ht-lab.ducr.u-tokyo.ac.jp/wp-content/uploads/2021/09/07a703c580bfbdd8db6a6f8_29664754c.pdf).
44. Ministry of Internal Affairs and Communications. ICT urban development promotion council smart city study WG document. 2017 [cited 2021 Sep 1]. Available from: [https://www.soumu.go.jp/main\\_content/000467133.pdf](https://www.soumu.go.jp/main_content/000467133.pdf).
45. Ivars-Baidal JA, Celdrán-Bernabeu MA, Femenia-Serra F, et al. Measuring the progress of smart destinations: The use of indicators as a management tool. *Journal of Destination Marketing & Management* 2020; 19: 100531.
46. Chilkey H, Zaobar T. Innovation architecture-methodology for innovation strategy formulation. Tokyo: Doyukan; 2009.
47. Nakamura K, Kameoka K. Service business planning towards shared service road mapping: An application to rf-id using service in the research activities of a Japanese industrial association. *World Scientific Series in R&D Management* 2018; 2(15): 509–551.
48. Kasahara S. Smart tourism development in the region, tourism information service, data linkage, service portfolio. *Systems/Control/Information* 2019; 63(1): 2–7.
49. Hitoshi M. Discourse on “Intercultural Understanding”—Pitfalls of cultural essentialism. *The Pitfalls of Cultural Essentialism*. Kyoto: Kyoto University Press; 2002.
50. Cabinet Office. New economic and fiscal revitalization plan: Reform process chart 2020. 2020 [cited 2021 Sep 1]. Available from: [https://www5.cao.go.jp/keizai-shimon/kaigi/special/reform/021218\\_devided/report\\_201218\\_2\\_2.pdf](https://www5.cao.go.jp/keizai-shimon/kaigi/special/reform/021218_devided/report_201218_2_2.pdf).
51. Ministry of Land, Infrastructure, Transport and Tourism [Internet]. Interim report on the realization of smart cities. 2018 [cited 2021 Sep 1]. Available from: <https://www.mlit.go.jp/common/001249774.pdf>.