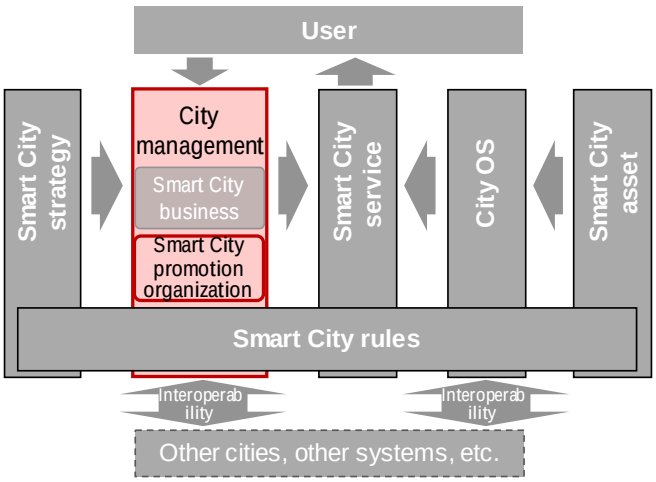
5. City Management

5.1 Smart City promotion organization

5.1.1 Positioning of Smart City promotion organization



One of the essential mechanisms for "City management" which enables the sustainable management of Smart City and City OS is a Smart City promotion organization which defines "who does what". In practice, the effective organization is formed by organizing stakeholders into six types such as service providers, primary promoters, advisors, etc., and designing the way each party participates and the functions required within the primary promoters, who play the most important roles. As Smart City promotion organizations should differ significantly from region to region depending on various conditions, including who the players residing or interested in each region are and what the defined Smart City strategy and measures to be implemented are, only a framework for organizing it is presented in this section. However, the players and functions of the primary promoters, which can be regarded mostly common in any region, are presented for reference.

When examining Smart City promotion organizations, it is necessary to specify the functions required from various perspectives. Mainly because it is necessary to implement functions for each component defined in this reference architecture, it is important to think primarily of the organization required for the development and operation of each component when implementing them.

5.1.2 Framework for organizing stakeholders

Stakeholders can be broadly categorized into six types, namely, (A) "service user (beneficiary)" who has the needs to be met by the Smart City services provided, (B) "service provider" who provides Smart City services to (A), (C) "primary promoter" who is expected to have primary responsibility, decision-making authority, leadership, etc. for the promotion and operation of Smart City as a whole, (D) "advisor" who is not a part of (B) or (C) and provides guidance from outside as necessary, (E) "auditor/checker" who performs check and confirmation from the outsider's perspective in the same way as (D), and (F) "investor/data provider, etc." who provides resources necessary for the development and operation of Smart City and Smart City services, in some case for compensation. (A) service users may refer to not only residents but also all the individuals, corporations, and governments. Also, in many cases, multiple players may fit into each category of (A) through (F).

Although Figure 5.1-1 only shows examples, it is important that these stakeholders who have different objectives and play different roles recognize each other for the smooth promotion and operation of Smart City. Although (D) and (E) are not essential, they are deemed important in that the direction of (B) and (C) are guaranteed by external players and that leads to trust in the region. The existence of (F) varies depending on the situations of the region.

One thing to keep in mind is that it is entirely possible for a player with multiple purposes to play multiple roles described below. For example, the beneficiaries may include not only residents but also local businesses, and there may be cases in which such businesses are also service providers of other services. Please refer to Figure 5.1-1 for more details on the objectives and roles of each stakeholder.

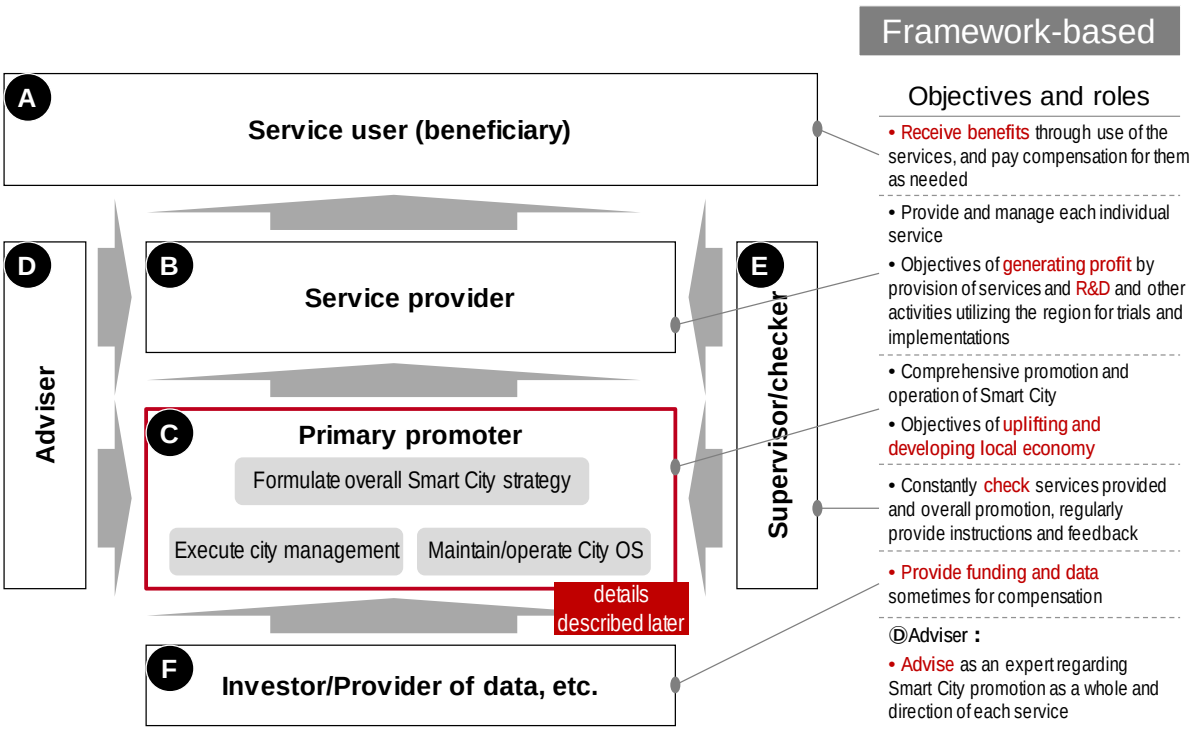


Figure 5.1-1 Types of stakeholders in Smart City

5.1.3 Players potentially relevant to Smart City

In each region, there are a wide range of types of potential stakeholders from various points of view. As shown in Figure 5.1-2, in many cases, all of government, industry, academia, and individuals could be covered, and depending on their objectives and characteristics, it is necessary to consider how to organize their appropriate and continuous involvement. For more details, please refer to some examples described later in “5.1.5 Examples of Smart City promotion organization”.

As one of the ways to manage these stakeholders, multi-agency organizations such as councils could be formed. These are mainly formed for the purposes of information sharing and unification of objectives and directions when there are multiple players who share the same objectives, and primary promoter could often be a multi-agency organization.

Smart City promotion organization is to be constructed by considering what types of players with what kinds of capabilities are present in the region in reference to Figure 5.1-2, and then determining which functions could or should be assumed by them as shown in "5.1.2 Framework for organizing stakeholders " and, in the case of primary promoter, "5.1.4 Examples of roles and functions of primary promoter".

Exemplification-based

Player category		Main role expected to play
Public	National government	Present the direction of Smart City for all of Japan, manage deregulation
	Local government	Present the direction of Smart City for the region, overall management, coordination with the Government, etc.
Industry	Local company	Provide knowledge based on local trends
	Out-of-area Company	Provide knowledge on latest technology based on the trends in the country and around the world
	Trade association	Provide knowledge based on the local industry, coordination of interests * Tourism association, Chamber of Commerce and Industry, hotel association, local industrial association, etc. are assumed
Academia	University	Provide academic and expert knowledge, advanced research demonstration
	(Private) research institute	Provide expert knowledge, advanced technology demonstration
Private	Resident	Provide opinions and perform checks on the direction of Smart City, use services and provide feedback as users
	Civic organization	Form consensus of residents, summarize residents' opinions and reflect them on Smart City of the region * Ward council, Citizen hackathon, etc. are assumed
	Visitor (tourists, etc.)	User services and provide feedback as users
Multi-agency organization (council, etc.)		When those involved surpass certain number, a multi-agency organization, such as council, is formed to make discussions easier, share directions, foster unity of the region, etc.

Figure 5.1-2 Players potentially relevant to Smart City

5.1.4 Examples of roles and functions of primary promoter

Primary promoter is the essential stakeholder and responsible for determining the overall direction of the Smart City in the region. They formulate the overall Smart City strategy with the objectives of raising and developing the economy of the whole region, and function as players responsible for city management and operation/management of City OS to implement the strategy.

While the functions necessary for primary promoter must therefore address all aspects of Smart City operation of the region, because they always change depending on the characteristics of the region, the number and type of players involved, and the progress status of Smart City in the region, it is difficult to specify all functions uniformly.

To assist, Figure 5.1-3 shows examples of the roles primary promoters should generally play in promoting Smart City in the region while also referring to the various components defined in other chapters of this report. By assigning appropriate players to them, primary promoter is formed as an organization. It is also possible to outsource substantive management and operational functions, excluding strategic decision-making and the like, rather than managing all the necessary knowledge and skills in-house.

In addition, it is not necessarily required to organize all the functions comprehensively from the beginning, as it is possible to expand the functions as needed in response to the progress of Smart City promotion in the region.

Figure 5.1-4 shows detailed descriptions of each function.

Recommendation/
Exemplification-based

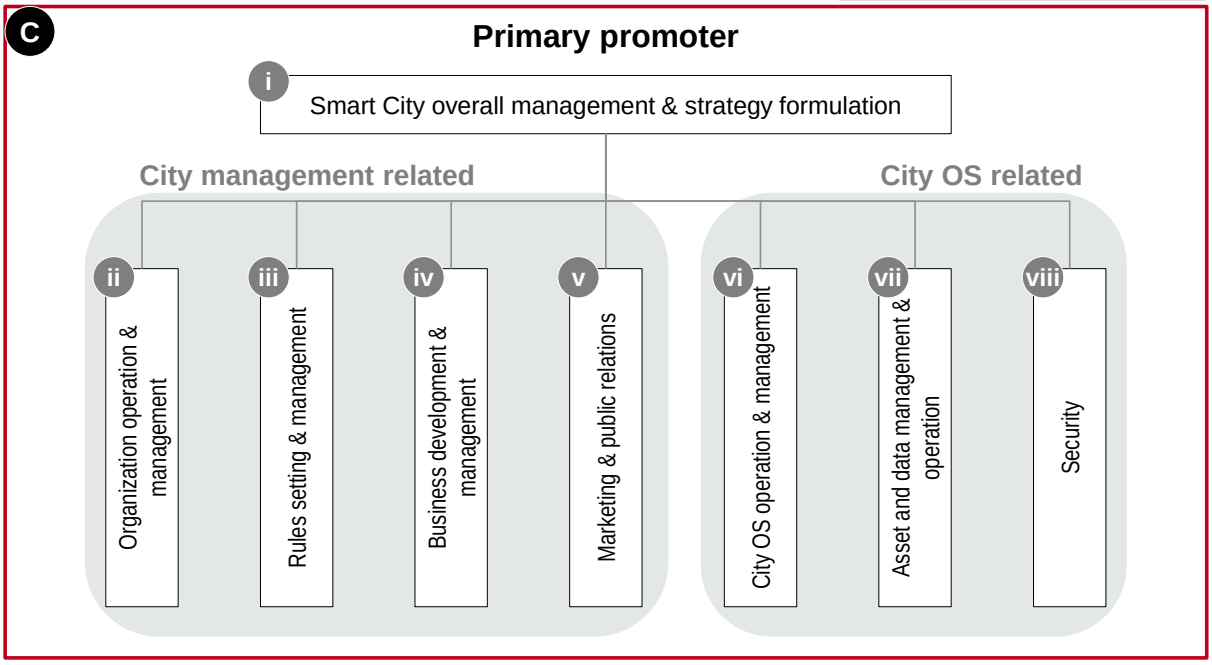


Figure 5.1-3 Examples of functions primary promoter should assume

A function particularly easy to overlook is (v) marketing and public relations. Having users “gladly use” Smart City services should be regarded as the priority number one, and to do so, it is essential to make sure the availability of each service and how to use it properly are well acknowledged by the users. In many Smart Cities, it is necessary to get funding and participation from businesses, and also the objectives may be to attract tourists and incoming migrants. In order to achieve them, it is important to attract the interest of each target user and deliver the most appropriate information, and it is recommended to establish marketing and public relations systems for such purposes.

Additionally, (v) marketing and public relations function is important from the standpoint of ensuring interoperability, as it provides a clear point of contact in collaborating with other regions and other systems. When other regions express interest to federate with City OS of the region or deploy the best practices of the region, it is equally important to clearly describe where and how to interface as well as organize what to make connection with. Efficient external interoperability and lateral expansion can be realized by way of public relations and a point-of-contact functions for the country and other regions.

Exemplification-based

	Main function	Details
i	SC overall management & strategy formulation	Formulate and manage overall strategy of Smart City, and perform overall management to realize Smart City according to the strategy
ii	Organization operation & management	Supervise stakeholders, establish and manage primary promoter to make the whole Smart City function smoothly
iii	Rules setting & management	Establish and manage rules and guidelines necessary for the promotion of Smart City
iv	Business development & management: Service development & management	Develop services through experience design for each field of business conducted in Smart City in the region, and manage services provided and managed by each service provider * Subcommittee, etc. for each business field may also be assumed
	Business development & management: Financial management	Build and manage business model with the aim of sustainable management of the whole Smart City, and manage all the financial matters which may arise
v	Marketing & public relations	Manage public relations for the country and other communities as well as residents, tourists, and business operators, and work as a point-of-contact for information collaboration
vi	City OS operation & management	Develop and operate digital systems including City OS, and determine and manage API interface of services, federations to other communities, etc.
vii	Asset and data management & operation	Manage assets in the region, acquire and store data from residents, public administration, service providers, etc., analyze them, and promote their utilization by the whole Smart City
viii	Security	Ensure security of the whole digital systems including from City OS to services and assets

Figure 5.1-4 Examples of functions primary promoter should assume: details

5.1.5 Examples of Smart City promotion organization

5.1.5.1 Smart City promotion organization in Aizu-Wakamatsu-city[11]

One of the characteristics of Smart City promotion in Aizu-Wakamatsu-city is the realization of industry-government-academia-finance-labor-press sectors collaboration. As Figure 5.1-5 shows, while Aizu-Wakamatsu-city performs the central function of overall management, etc. of Smart City, (a) Aizu-Wakamatsu-city Comprehensive Collaborative Council for Revitalization of Region/People/work (hereinafter called Comprehensive Collaborative Council) comprised of a large number of stakeholders from industry-government-academia-finance-labor-press sectors, and (b) Aizu Region Smart City Council (hereinafter called SC Council) comprised of mainly Aizu University and local companies, are promoting and realizing the city's Smart City in collaboration with each other and sharing their roles.

(a) Comprehensive Collaborative Council gathers information on services, etc. related to Smart City based on the latest technological trends in Japan and around the world by conducting questionnaires and exchanging opinions with participating companies in each business field. In addition, it is responsible for evaluating and providing feedback on the progress of the city's Smart City based on KPIs.

(b) SC Council is implementing Smart City measures with the participation of Aizu-Wakamatsu-city as the secretariat. Specifically, the city is currently operating "Aizu-Wakamatsu Plus" which is the city's City OS and data collaboration platform, and "Visit Aizu" which is an inbound tourism platform, and others. As for the latter tourism platform, the SC Council is working in collaboration with surrounding municipalities as well as Aizu-Wakamatsu-city, and functioning as a forum for collaboration and exchange of opinions, realizing for example the establishment of a digital DMO[12] subcommittee as a forum for discussion among these municipalities.

Not all the measures utilizing ICT are necessarily implemented by the SC Council, but there are several examples of direct outsourcing from the city, and implementations by other public-private sectors councils and private companies. The existence of the SC

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[11] Smart City promotion organization in Aizu-Wakamatsu-city: Created based on Information provided by Aizu-Wakamatsu-city

[12] DMO: stands for Destination Management/Marketing Organization, a corporation which takes a lead in regional tourism development with a scientific approach involving various stakeholders in the region.

Council must avoid leading to the creation of new vested interests and a sense of unfairness in the new field known as Smart City. It requires flexible region management with a sense of balance in accepting various approaches, such as making the SC Council an open organization enabling relatively easy participations of the companies which wish to join the council.

Furthermore, Aizu-Wakamatsu-city believes that it is important for the residents to actually experience the initiatives in order to deepen their understanding of Smart City, and has been making efforts to create services that feel familiar in their daily lives. In addition, the city's policies and measures are periodically evaluated by the "External Evaluation Committee" comprised of external experts and publicly recruited citizens, and their opinions are collected to use them for future planning and development.

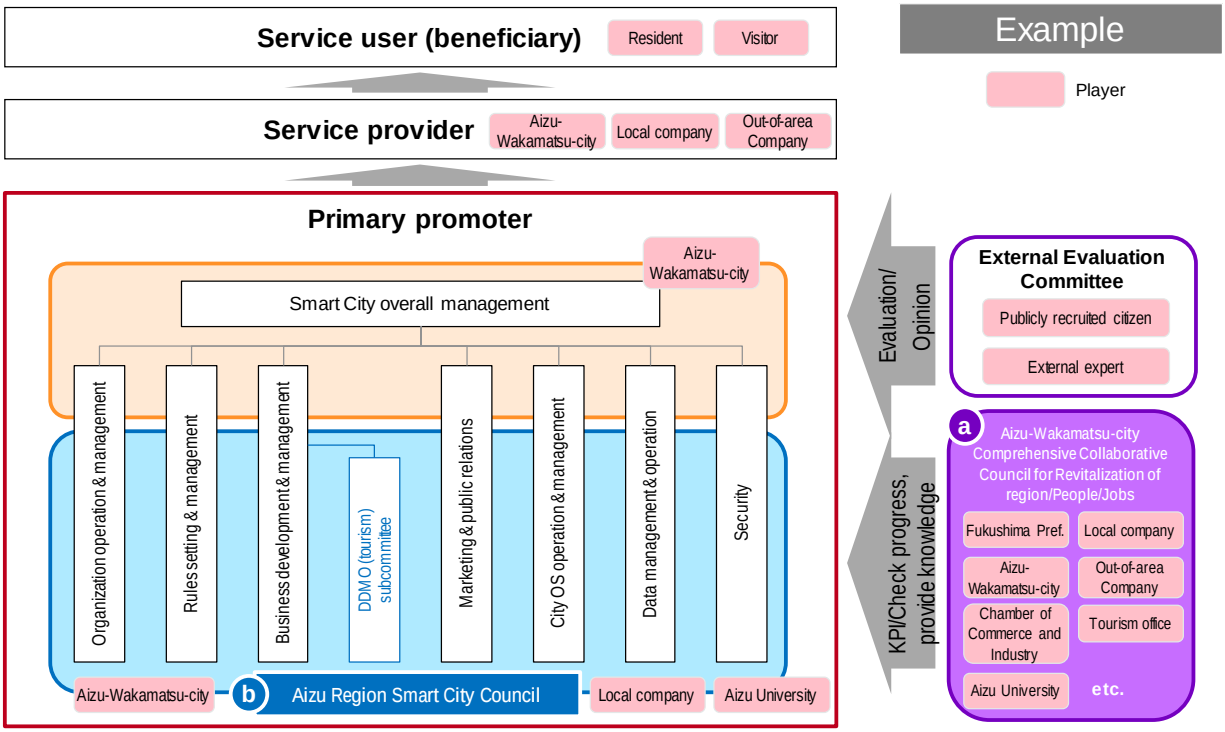


Figure 5.1-5 Example of the organization in Aizu-Wakamatsu-city

5.1.5.2 Smart City promotion organization in Takamatsu-city[13]

Takamatsu-city established Smart City Takamatsu Promotion Council in October 2017, promoted by Takamatsu-city and six companies/groups, as an organization to promote the proper and effective use of public and private data on a common platform (Smart City transformation) with the aim of resolving regional issues through industry-government-academia-civic sectors collaborations. This council functions as (C) primary promoter with the goal of realizing Smart City which promotes the creation of innovations, inter-regional collaborations, and synergies by stimulating the movement of people, goods, and information through the use of various data of the city.

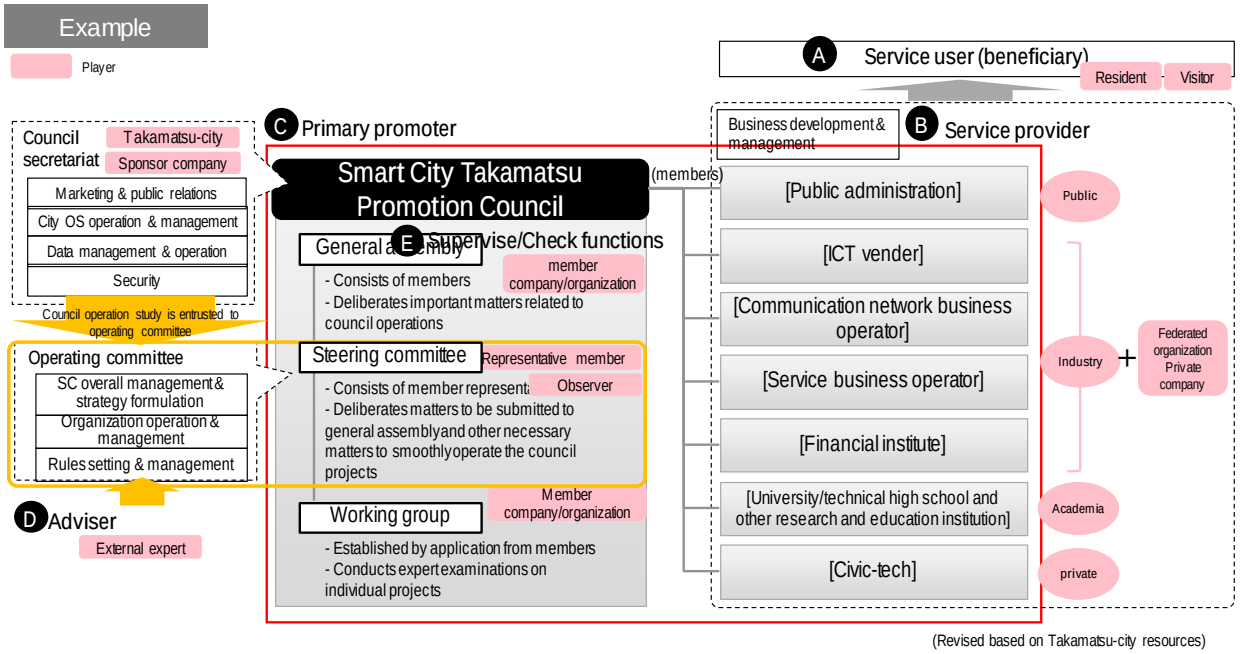
In order to achieve this goal, the organizational functions and operational design are put in place to enable autonomous activities by a wide range of participants from industry-government-academia-civic sectors coming together rather than Takamatsu-city having jurisdiction over the council as an administrative function. At the time of the survey, although the council is chaired by the mayor of Takamatsu-city and its secretariat is assumed by ICT Promotion Office of Takamatsu-city, the central issue for the operation of the council "in what areas and with what solutions should the council members be encouraged to initiate innovations to realize Smart City of Takamatsu" is entrusted to a steering committee comprised of experts from industry-government-academia-civic sectors. This steering committee plays a central role of the primary promoter, and deliberates on overall strategies and operational improvements, etc., while incorporating the opinions of (D) external advisors. In addition, important matters related to the operation of the council, such as rules and business plans, are deliberated and decided through the general assembly composed of council members, hence the (E) supervising and checking function is fulfilled as an internal function of the primary promoter.

In addition, the council has established and operates working groups based on proposals from council members, and has functions as a forum for business review and development where organizations and companies which serve as (B) service providers coordinate with various related parties and conduct specific planning and examination of new applications and services which use data utilization infrastructure.

Furthermore, the council stages events which are not limited to the council itself but broadly open to public, and conducts activities to increase opportunities for interaction between council members and the region (local residents and organizations) and between

[13] Smart City promotion organization in Takamatsu-city: Information source: Takamatsu-city

Takamatsu-city and other cities. In fact, it has staged "ICT Regional Development Ideathon" in collaboration with Kagawa University for the development of local human resources and application development courses for citizens in collaboration with the activities of regional data laboratory in 2018 and 2019, and a collaborative symposium with advanced Smart City regions such as Aizu-Wakamatsu-city and Kakogawa-city in an effort to raise awareness and disseminate information sharing among various entities involved in Smart City promotion of Takamatsu-city.



Resource document: Takamatsu-city resources, NEC technology report https://jpn.nec.com/techrep/journal/g18/n01/180115.html

Figure 5.1-6 Example of the organization in Takamatsu-city

5.1.5.3 Smart City promotion organization in Otemachi, Marunouchi, and Yurakucho district

Otemachi, Marunouchi, and Yurakucho district (hereinafter expressed as “OMY”) was selected as a leading model project for the Smart City Model Project (2019) publicly offered by the Ministry of Land, Infrastructure, Transport and Tourism, and is proceeding with Smart City initiatives in a 120 ha (about 300 acre) area between Tokyo Station and the Imperial Palace.

Figure 5.1-7 shows the organization scheme for the Smart City Model Project. In order to apply for the model project in the area, “OMY District Smart City Promotion Consortium”[14] was formed by three parties of “The Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho” (herein after referred as “OMY Area Development Council”) which is a regional development organization with the area's landowners as members, “Chiyoda Ward”, and “Tokyo Metropolitan Government”. This consortium is the Smart City primary promoter ((C)) with the objectives of "gaining international recognition by realizing a Smart City Model for the city’s established downtown areas " and "establishing an Area Management Model driven by data utilization". It aims to promote value creation by companies in the area through collaborations with various organizations in the area engaged in regional development activities by way of various software such as tourism, environment, disaster prevention, etc., and also through establishing data infrastructure and City OS. Based on such infrastructure, companies, governments, area management organizations, etc. within and outside the area are to provide a wide variety of conveniences as service providers ((B)).

As for the roles of the three parties composing the consortium, under the "Vision & Implementation Plan" formulated by the three parties, the OMY Area Development Council is responsible for "hosting and supporting verification experiments and events" and the Ward and the Tokyo Metropolitan Government are responsible for cooperating and supporting the regional development activities in the area, such as "examinations of and cooperation on permissions to use public space and facilities" necessary for the piloting and events. The study on data utilization in the future will also be conducted through collaboration between public and private sectors.

[14] OMY District Smart City Promotion Consortium: Information source: OMY Area Development Council

Example

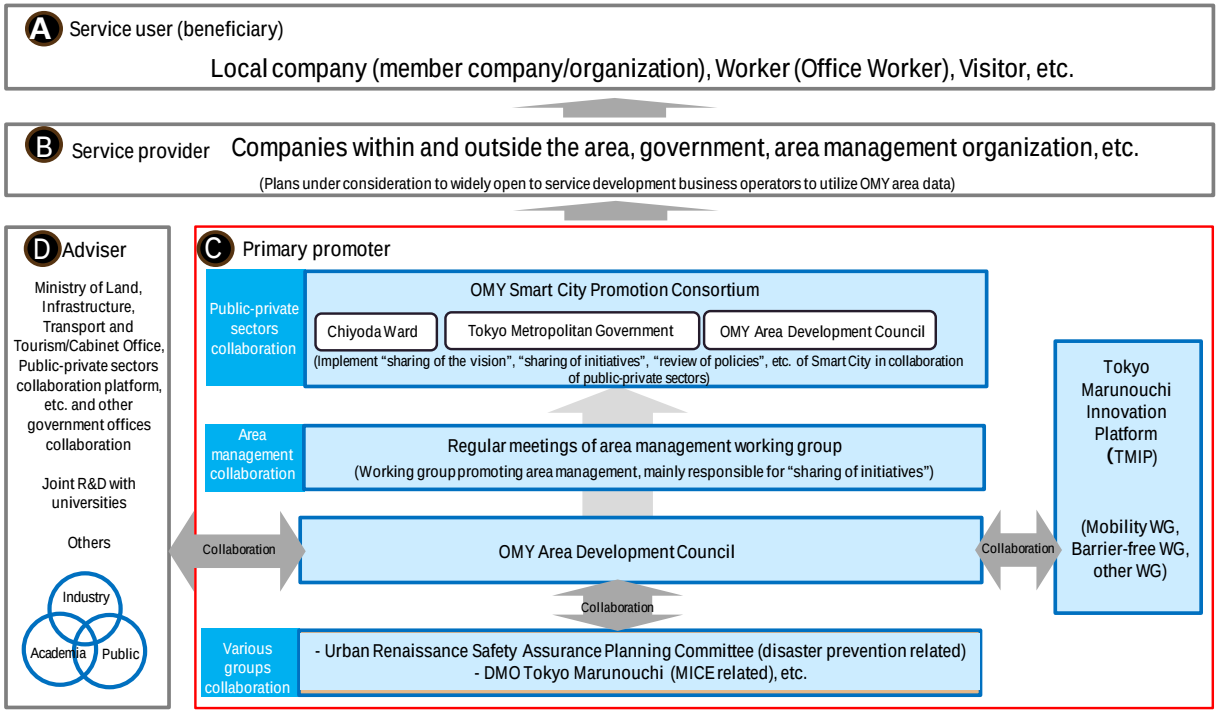


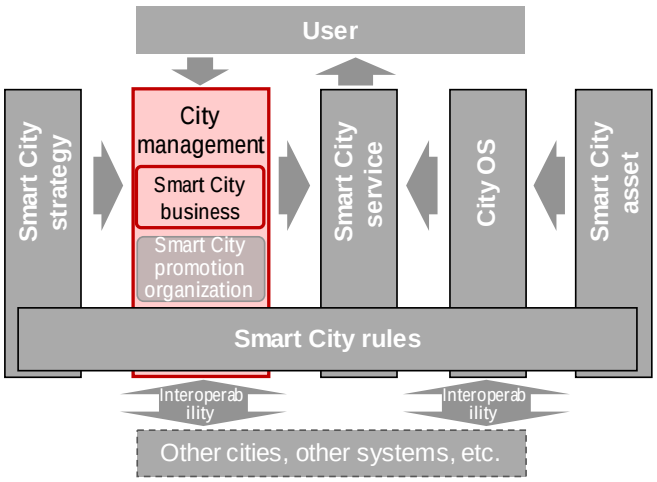
Figure 5.1-7 Example of the organization for the OMY District Smart City Model Project by the Ministry of Land, Infrastructure, Transport and Tourism

One of the characteristics of the organization in the OMY District is that the OMY Area Development Council, a regional development organization in the area, is the Smart City primary promoter. The council has been in continuous operation for more than 30 years since its establishment in 1988 as an organization promoting regional development in a collaborative partnership between public and private sectors. In addition, all of the landowners in the area are corporations, organizations, or governments, and since all the landowners participate in the council, the member companies and organizations have functions, in some cases, as the service providers (B) as well as being the beneficiaries (A) of the Smart City services in the area. This has led to the higher potential of promoting Smart City transformation with higher level of dynamism and speed by stakeholders who can act in a variety of positions. They hold committee meetings, etc. and promote projects in each field, while receiving support from the government and research institutions, etc. (D).

This can be recognized as a model case in which regional development organization (area management organizations and others) is the dominant organization to function as primary promoter, when district-based Smart City initiatives are promoted in other cities and regions, especially in established downtown locations.

5.2Smart City business

5.2.1 Positioning of Smart City business



What constitutes "City management" in tandem with promotion organization is the mechanism to manage and operate the business-oriented components of Smart City. It consists of business model management and experience design.

Business model enables structural understanding of the interaction between the multiple players involved in Smart City for the provision of goods, services, etc. and the payment of money or other consideration. By constructing this model with a bird's eye view of the whole Smart City, it clarifies the value, compensation, and other financial resources which each player must provide, hence it is an important component of Smart City as it makes it possible to ensure the sustainable operation of each player and in turn the whole region. However, it is difficult to present a uniform framework because the business model is expected to be different from region to region depending on the characteristics of the region, the players involved, and the relationships between them. Therefore, in this section, examples of business models classified into three basic types are presented for each region to refer to as a starting point for discussions on building business models and to enable them to examine according to the characteristics of their own region. While referring to these models as necessary, it is also important that the whole region continuously searches for the business model that matches the characteristics of each region.

In addition, it is necessary to organize Smart city promotion organizations particularly aiming to management of the business model since the more specific are the participating players of various forms and the clearer are their objectives, the easier it becomes to build a specific business model. At the same time, in order to improve the profitability of the business model, the use of services by users is a necessary condition, therefore, it is important to enrich the relevant functions of Smart City primary promoters such as marketing.

Another component in the Smart City business is experience design. In order to realize a Smart City that is "user-centered" and truly for the benefit of users, it is essential that the services designed to meet the needs of users get actually used by the users, and the objective of Smart City in the region should be to improve the overall value of user experience through services. Experience design shows the methods to develop and provide services to realize that objective. Specifically, some examples of frameworks and available tools are presented as convenient resources that can be used to derive the necessary measures and then design respective services to provide to the users, through understanding the essential needs from the user's point of view, and also to continuously develop the service after its launch.

It should be noted that the important point is “Smart City design with user-centered experience in mind”, and it is not necessarily required to utilize various methods and tools presented as examples. It could rather be said that if those involved in Smart City utilize only the methods and tools of experience design without having the “user-centered” aspect in mind, the resulting effect will be extremely limited.

Smart City services need to be designed from the user's point of view and at the same time deployed meeting the goals defined in the Smart City strategy. It should also be noted that it is necessary to be aware of consistency with the requirements specified in City OS since each service has certain elements on the digital platform in the form of applications, etc. and interfaces to City OS via API.

5.2.2 Basic business model

Business models are expected to differ from region to region depending on the characteristics of the region, the players involved, and the relationships among them. Therefore, while it is difficult to present a uniform framework, there are also some aspects which make it difficult for all the regions to design a sustainable Smart City business model from scratch.

For that reason, examples of the basic business models which can be adopted by each one of the following primary promoter patterns are shown in Figure 5.2-1. Even though there are various candidates for Smart City primary promoter, they can be broadly classified into three types: (A) Region Council-led with public-private sectors collaboration, (B) Local government (public)-led, and (C) Private sector-led.

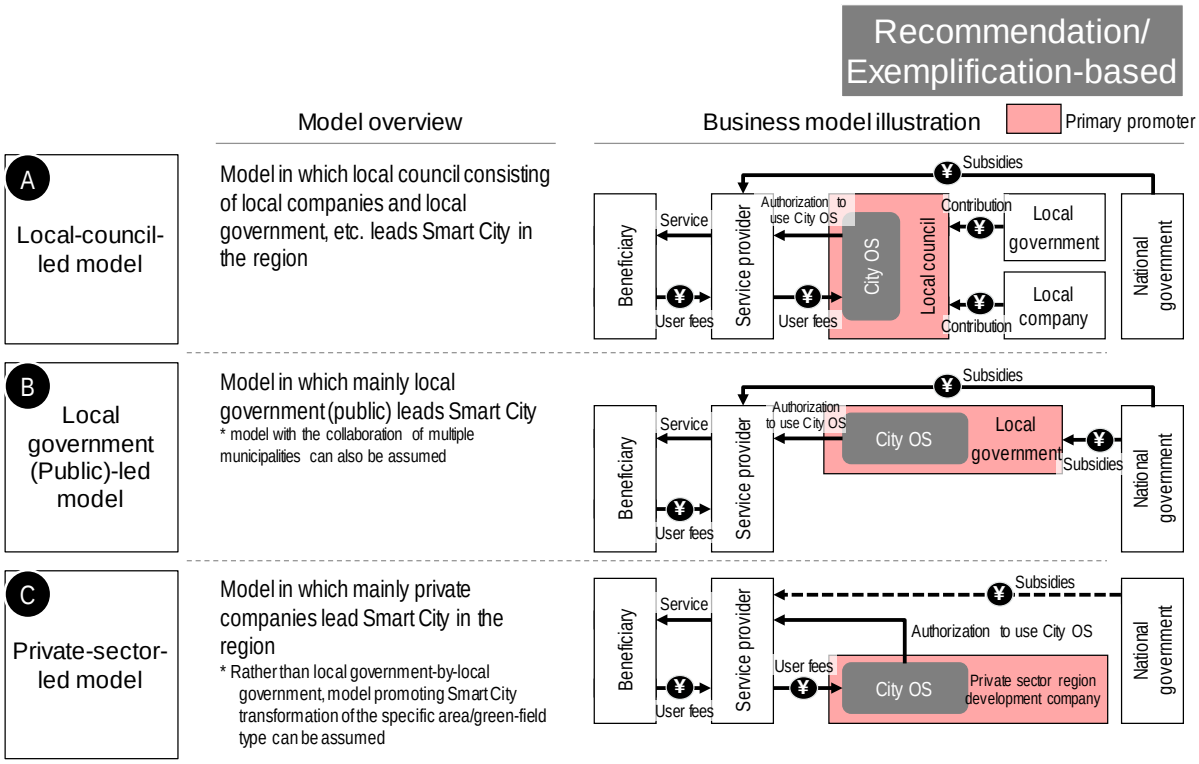


Figure 5.2-1 Examples of basic business model by initiative model

As a start point of discussions on business model development in a region, the business model of the primary promoter type which seems to fit best should be used as reference, and then it is necessary to make various improvements to the business model to match the characteristics of each region. For example, contributions and subsidies, etc., do not necessarily have to be money. In the case of public sectors, it could be support in the

form of deregulation, etc., and in the case of corporations, people (manpower), not money, could be provided. Also, service user fees are not necessarily required to be collected from beneficiaries. If the benefiting service is public in nature, the municipalities for example, rather than the beneficiaries, could be assumed to pay the fees instead. Even in the case of tourists being the beneficiaries, if the service is provided for the purpose of attracting tourists, the cost of providing the service may be borne by the local tourism association and the like.

As described above, Figure 5.2-1 is for examples only, and there could be various forms of its variation patterns. As more details are presented later by way of examples, the three examples in “5.2.3 Examples of business models” are based on the three types of basic business model (A) to (C) mentioned above and presented by making some improvements reflecting the actual situation in the regions (functions of primary promoter are shared by several organizations, or for the cases in which there is no equivalent of what is shown by arrows).

It should be noted that, when it comes to business model, it is difficult to realize an ideal structure especially in the early stages. For this reason, it is important to develop a business model with the ideals and future in mind, set them as goals, share them in the whole region, and proceed with Smart City initiatives. It should be noted that it is not necessarily required to realize a perfect business model right from the beginning.

5.2.3 Examples of business models

5.2.3.1 Business model in Aizu-Wakamatsu-city[15]((A) Council-led model)

In the case of Aizu-Wakamatsu-city, Aizu Region Smart City Council is managing City OS known as “Aizu-Wakamatsu Plus”, and it falls under (A) Local-council-led model (Figure 5.2-2). Although contribution from Aizu-Wakamatsu-city, in other words, the government, is an important source of funding, this organization is characterized by its nature of government-industry-academia sectors collaboration as mentioned earlier, and is an example of the case in which Smart City promotion is not only conducted under the budgets obtained from the government, but also operated by way of the collaborative council of government-industry-academia sectors with local companies, Aizu University and others. Furthermore, there are a number of projects within this case in which national subsidies related to regional revitalization are used to promote and operate Smart City. Based on the track records of Aizu-Wakamatsu-city in implementing various projects as "leading-edge demonstration fields”, there are cases in which subsidies are provided to those service providers to implement further leading-edge projects for demonstration and it represents a form of promotion which also utilizes government support.

In addition, as shown by the red arrows in Figure 5.2-2, the implementation of various Smart City measures can be taken as an effort to improve the convenience of citizens, increase the number of residents and the population involved through the concentration of ICT industries, and further revitalize the local economy through the synergistic effects of these efforts. Therefore, from a long-term perspective, it is possible to expect an increase in various tax revenues due to population growth and economic revitalization, and therefore the investment of funds by the government can be justified with a certain degree of rationality. It could be said that, because locally-based companies are also more or less aware of the importance of such long-term economic effects, the participation of industry sectors is realized primarily with local companies at its center in Aizu-Wakamatsu-city. In addition, in the case of Aizu-Wakamatsu-city, there are cases in which the love for home region and the passion for making region contribution itself are the motivations, and therefore the motivations for local companies to participate in Smart City should not necessarily be limited to the financial value transactions, but should be treated with flexibility.

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[15] Business model in Aizu-Wakamatsu-city: Created based on the information provided by Aizu-Wakamatsu-city

One of the points to be specifically discussed in each region is the "flows to be implemented in the future", as indicated by the dotted arrows in Figure 5.2-2. As Aizu-Wakamatsu-City aims to minimize its dependence on government funds in the future and to build a self-sustaining ecosystem, it therefore believes ideal to collect user fees from service users and City OS usage fees from service providers. As such, a step-by-step construction of business model is important for initiating and promoting Smart City initiatives.

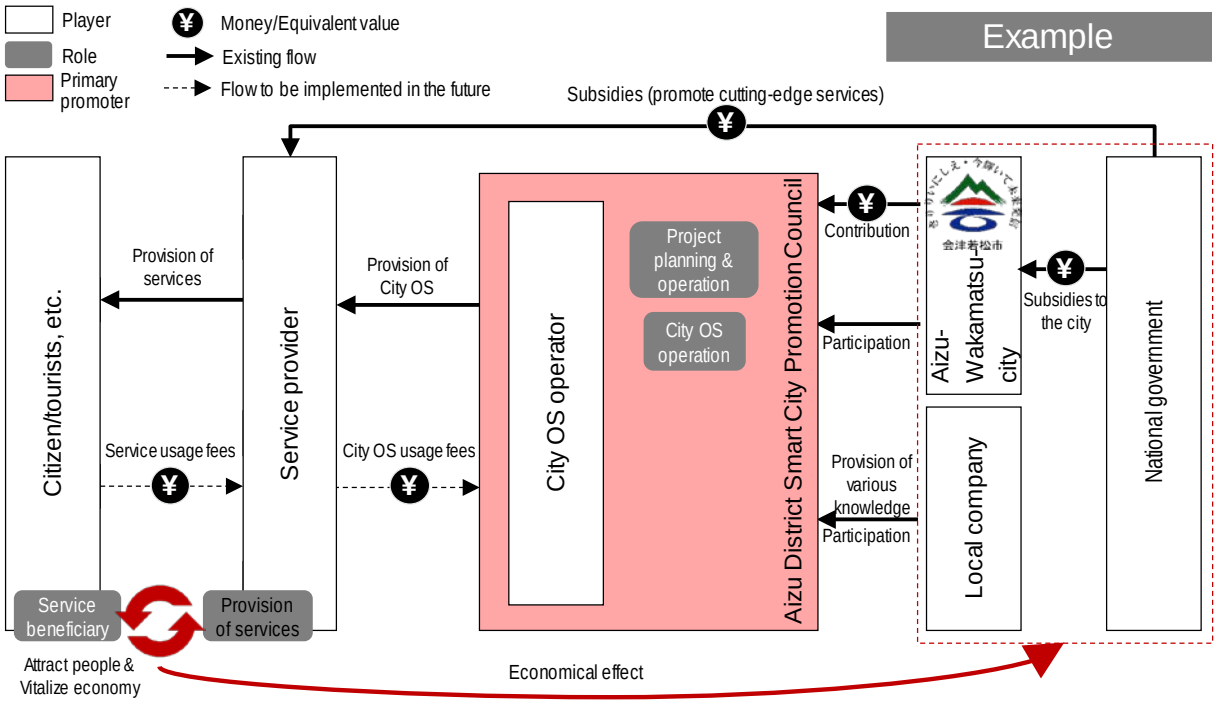

Figure 5.2-2 Example of business model in Aizu-Wakamatsu-city

5.2.3.2 Business model in Toyama-city[16]((B) Municipality-led model)

Toyama-city is regarded as the city promoting compact city policies most vigorously in Japan, with the slogan of “Realizing a city of sustainable added-value creation by compact city strategy”. While promoting the revitalization of downtown area and increased residency in the areas along public transportation lines based mainly on the revitalization of public transportation, it is proceeding with a highly centralized compact regional development to enable the improvement of QOL of the citizens consistent with fostering of industries.

It is a progressive region which has led the rest of the country in formulating visions and plans and implementing policies to achieve them.

In March 2020, with the inter-connection of streetcar lines which used to run separately on the north and south sides across Toyama Station, it marks the significant culmination of the city design plans, including the compact city policy, spearheaded by Toyama-city. In addition to making the physical space (real) more compact, Toyama-city has initiated to make the cyber space (virtual) smarter as the next step in regional development.

As a part of the Data Utilization Smart City Promotion Project by Ministry of Internal Affairs and Communications (FY 2018), Toyama City has constructed "Toyama-city Sensor Network" which consists of an IoT sensor network (LoRaWAN) covering more than 98.9% of the city's residential areas and an IoT platform to manage and utilize data obtained from various IoT sensors via the network. In addition to utilizing this infrastructure for administrative tasks using IoT technology such as resolving regional issues and expanding new disaster prevention capabilities, Toyama City is conducting "Verification Experiments Public Participation Project utilizing Toyama-city Sensor Network” which aims to revitalize local industries by providing the infrastructure as the verification experiment environment free of charge to private businesses, etc.

In addition, since FY 2016, “Toyama-city Lifeline Common Platform Project” has been in progress with the aim of reducing the maintenance and management costs of social infrastructure in the public and private sectors and strengthening the overall readiness of the public and private sectors as a whole to respond in the event of a disaster by sharing and commonly utilizing the information owned by Toyama-city and electricity, gas, water, and telecommunications companies. The project also aims to create new value in Society 5.0, improve citizen services and QOL in the new era, and revitalize business activities via

[16] Business model in Toyama-city: Information source: Toyama-city

federation with other systems such as “Toyama-city Sensor Network” and “Toyama-city Open Data Site”.

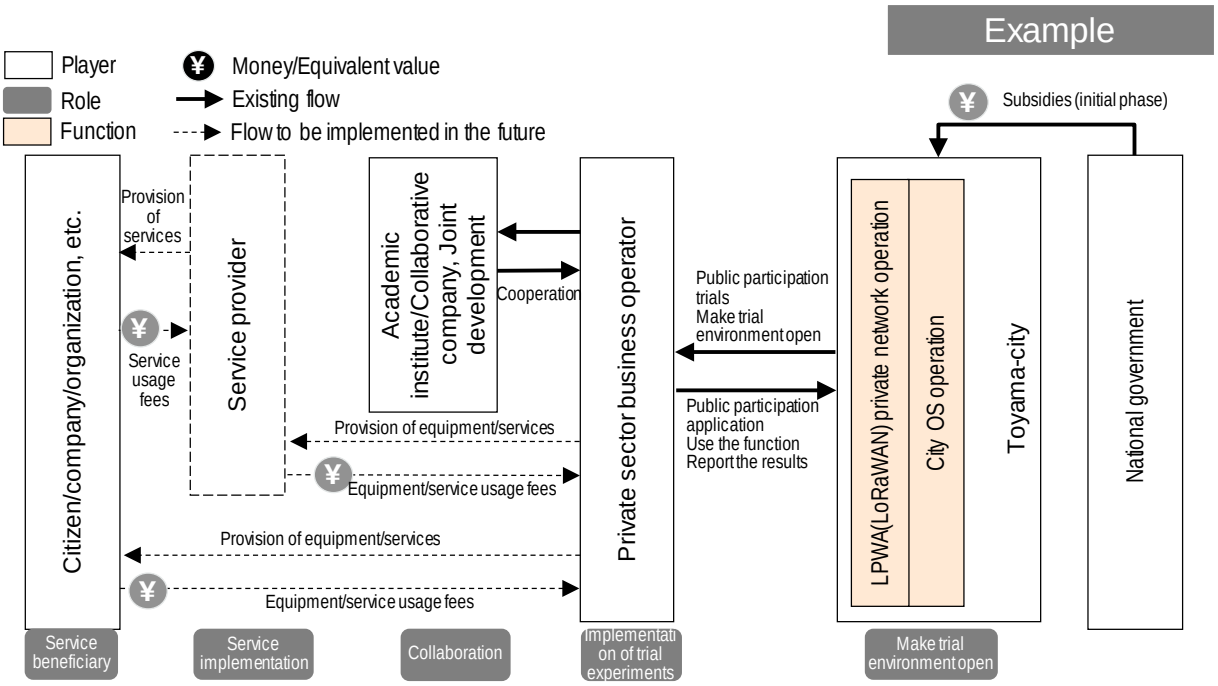

Figure 5.2-3 Example of business model in Toyama-city (2019 Verification Experiments Public Participation Project)

5.2.3.3 Business model in Fujisawa SST[17]((C) Private-sector-led model)

Fujisawa Sustainable Smart Town (known as FujisawaSST/FSST) is an example case promoted in Fujisawa-city, Kanagawa Prefecture. It is a development project on the former factory site of Panasonic (formerly Matsushita Electric Industrial Co., Ltd.) led by Panasonic, and the regional management is conducted by establishing a council and a town management company with many partner companies. This council is presented as (C) Private-sector-led model, since the public administration of municipality and others participate only as advisory, and the main members are private companies involved in the actual project (Figure 5.2-4).

Fujisawa SST Council as a primary promoter is composed of 18 partner companies and responsible for the formulation of business plans, marketing and other management tasks. The motivation for the partner companies to provide funding and manpower for the council is to collaborate with other businesses, residents, and municipalities as service providers to create new businesses and services, with the authority to be involved in the management of the whole region as a council member. In fact, verification experiments of various services for residents, etc., are constantly conducted in Fujisawa SST by private companies led by council members.

In contrast, the Fujisawa SST management company manages the basic operations to sustain the provision and operation of services, and this management company also plays a role in overall monetization related to the regional management. Primary investors, in addition to Panasonic, are Panasonic Homes, Mitsui Fudosan Residential, Dentsu, Tokyo Gas, etc. This management company provides residents with management services such as housing maintenance, information and communication services, and event management, and manages the business by earning fees for these services.

In the case of Smart City promotion via (C) Private-sector-led model, in comparison to (A) Local-council-led model and (B) Municipality-led model, it is particularly important that there is clear value for residents and participating private companies. That is because there is no stable income unless users are willing to pay fees having chosen to reside in that particular region, and because it is essential to attract partners with different technologies and knowledge without resorting to subsidies. In the case of Fujisawa SST, the value to the residents is ensured by providing residential space and services which utilize the most advanced technologies, and the participation of private companies is

[17] Business model of Fujisawa SST: Information source: Fujisawa SST Council

encouraged by the appeal of the region as a place where leading-edge technologies and services can be verified to the residents who have higher affinity to technology.

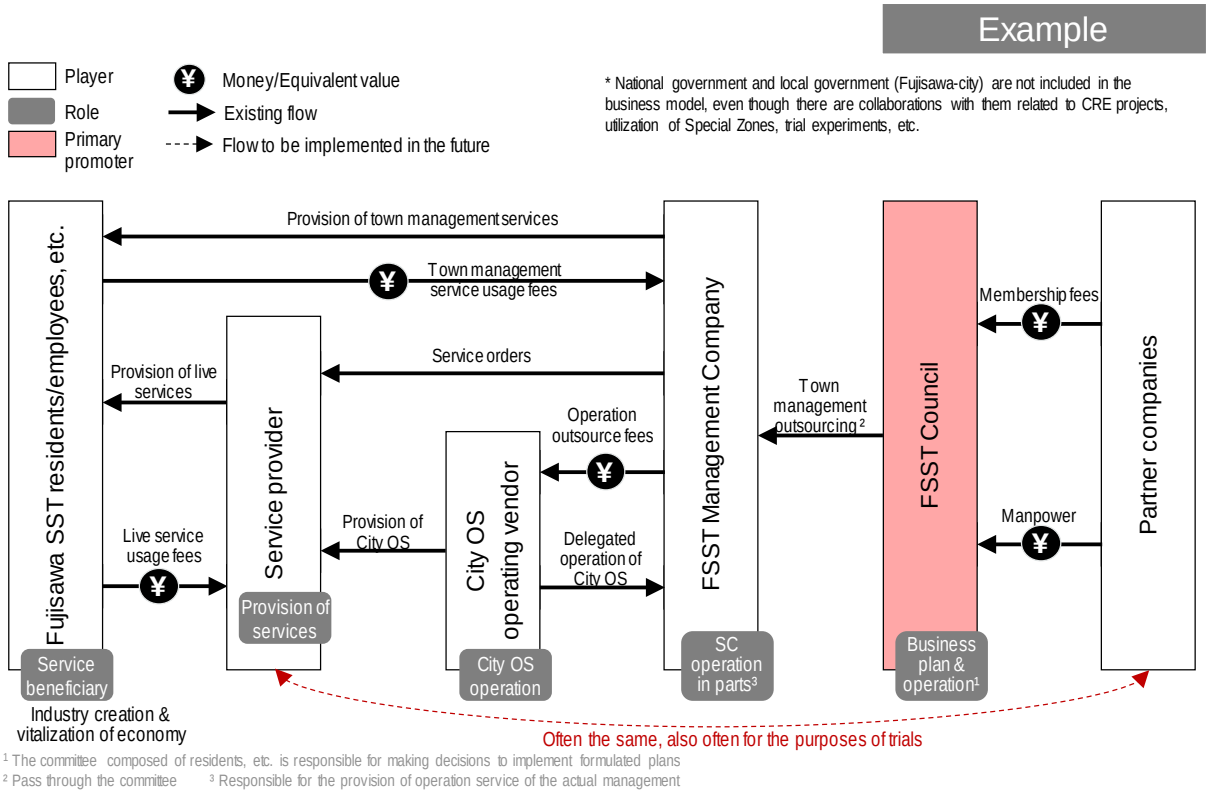

Figure 5.2-4 Example of business model in Fujisawa SST

5.2.4 Role of experience design

5.2.4.1 Components of experience design

Figure 5.2-5 shows the components of experience design. Experience design specifies measures to achieve sub-goals determined in “3. Smart City Strategy”. Each one of these measures is designed into a form which can be actually provided to users and becomes a service.

As Smart City services are expected to utilize digital technology, they are usually expected to combine both digital and non-digital components. In each service, there are “digital component” which refers to digital infrastructure, etc., such as applications and web sites as main examples, to enable interface to City OS, as well as “non-digital component” which refers to manual action, usually called business process.

In addition, when functions common to multiple services such as UI (user interface) and data analysis emerge particularly during the design of digital components, it is recommended to implement them as “common services” on City OS.

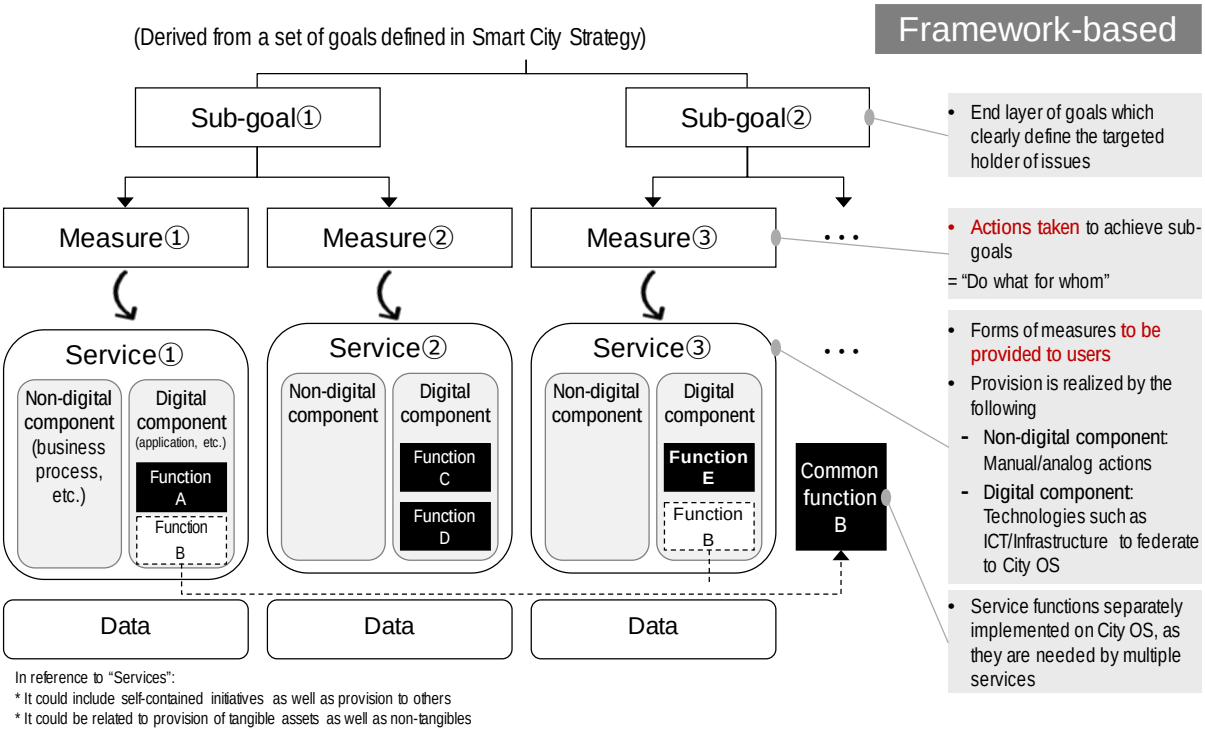

Figure 5.2-5 Components of experience design

5.2.4.2 How to apply experience design

Figure 5.2-6 shows a recommended method of applying experience design based on the components of experience design shown in the previous section.

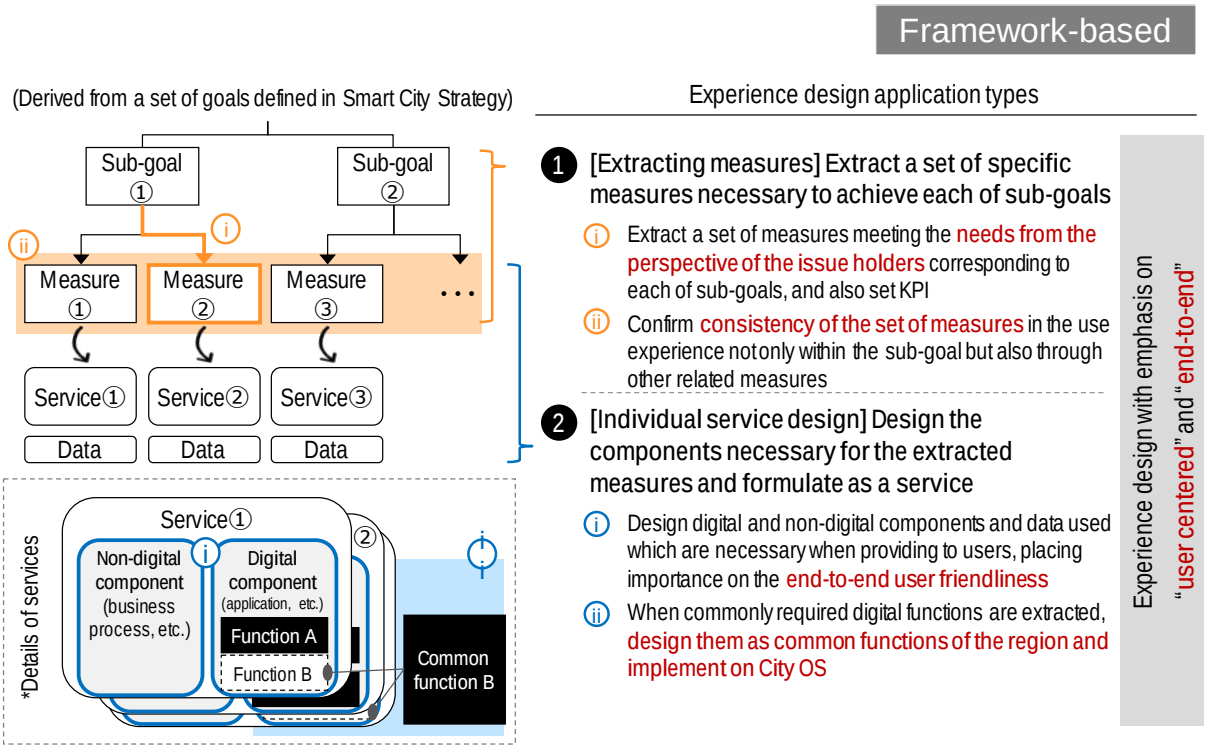

Figure 5.2-6 How to apply experience design

There are two main uses. One is to extract specific measures and sets of measures ((1) extracting measures). In the process of extracting sets of measures required for each of sub-goals, the most important thing here is to understand the essential needs from the perspective of the issue holders (i.e. the target of the measures) and to derive measures that meet those needs ((1)-(i)).

On the other hand, it would be desirable to avoid providing sets of measures with a view restricted to only within the sub-goals, but rather to provide comprehensive measures which covers multiple sub-goals from the perspective of users who live in the region and have various issues on a daily basis. Therefore, it is necessary to understand again the end-to-end user experience[18] from user's perspective not only within a sub-

[18] The end-to-end user experience means the entire series of user's thoughts, including emotions, and actions which occur from the point at which the user feels necessary to receive a service in order to achieve a certain

goal but also across other related measures, and ensure the consistency of the sets of measures ((1)-(ii)). For example, when following measures are extracted such as "Ensuring transportation for the elderly", "Improving the access environment for medical care for citizens", and "Improving the convenience of transportation in depopulated areas", it is possible to resolve these issues more efficiently and conveniently for the users compared to the case of providing the services separately for each issue, by reassembling the measures from the viewpoint of the issue holders to "Ensure the transportation necessary for medical care, shopping, and life in general with added consideration for the elderly in depopulated areas" instead of devising a separate service for each issue.

Another important use after the completion of the extraction of the measures is to design each derived measure as an individual service ((2) Individual service design). As mentioned earlier, service design requires the design of both non-digital and digital components. It is important to understand the service user's end-to-end experience and achieve the maximum user friendliness ((2) i).

In addition, by implementing those functions which are commonly used by multiple services on the City OS side, it leads to more efficient service management and promotion of further service development ((2) ii). For example, when providing administrative services to citizens through various web sites and applications, it is likely to be more convenient for citizens if there is portal site which functions as a point of contact with citizens, or if ID/PASS of citizens are consolidated. Also, if multiple rewards programs are implemented as incentive measures for activities such as walking, and volunteering, it should be possible to reduce service management costs by having a function to centrally manage these rewards or points gained. For more details on these types of common functions which can be implemented on City OS, please refer to the summary "7.2.1.1 (1) Common Services".

What is commonly important for all examples is to be mindful of "user-centered" and "end-to-end". With these in mind, the framework is presented below.

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purpose, to the point at which the purpose is achieved by receiving the relevant service, or to the point at which the user takes an action having done with the service (Source: Service Design Practice Guidebook).

5.2.4.3 Examples of framework for experience design

Figure 5.2-7 shows a generalized framework for experience design.

It mainly consists of 5 steps: “Empathize (with user needs)”, “Draw (concept)”, “Nurture (ideas)”, “Deliver (experiences)”, and “Evaluate (results)”. By following these steps, the aforementioned "(1) extracting measures" and "(2) individual service design" can be realized on a “user-centered” and “end-to-end” basis.

The points to note in practicing each step are shown in Figure 5.2-7. The points to be aware of throughout the entire process are the acquisition of detailed primary information, including the user's feelings and values, and the design and provision of measures reflecting this set of information to support a thorough user experience. Figure 5.2-7 also shows examples of tools commonly used in experience design. Please refer to them along with the examples presented later.

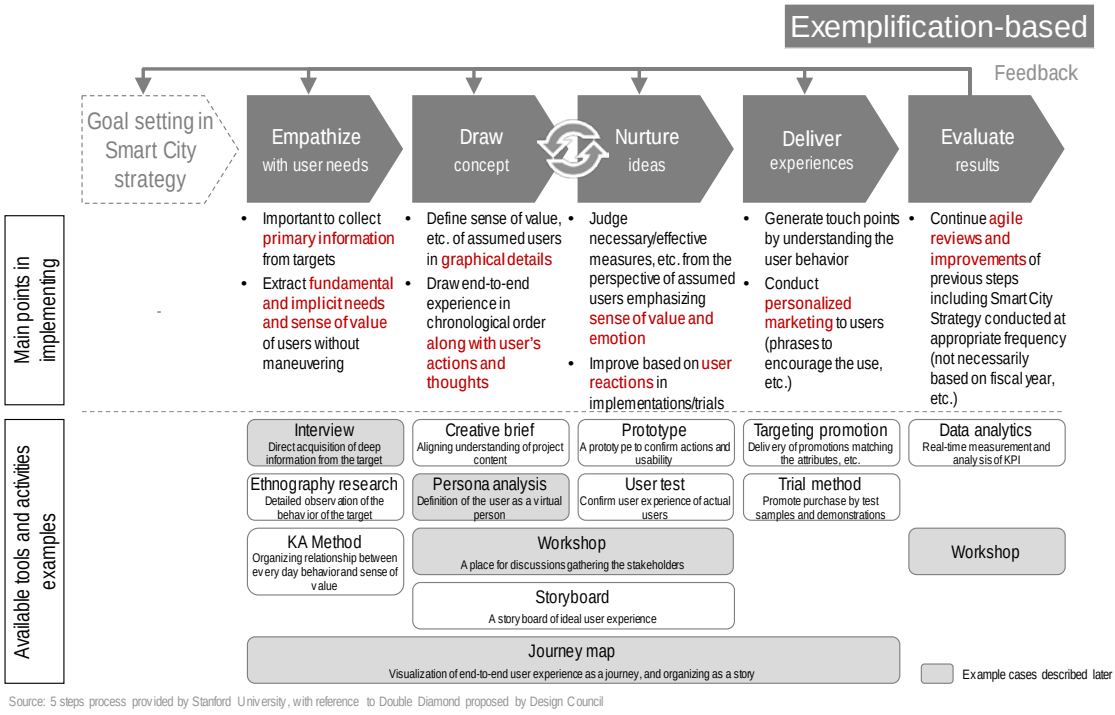


Figure 5.2-7 Example of framework for experience design

While it is not necessarily required to precisely implement these five steps in extraction of all of the measures and service design, it is desirable to be aware of them when designing services, etc. which form a central core of Smart City in the region.

In addition, it is desirable for all service designers to perform the extraction of measures and service design with these frameworks in mind, or at least being aware of the "user-centered" principle.

5.2.5 Examples of experience design

5.2.5.1 Experience design in Aizu-Wakamatsu-city[19]

In Aizu-Wakamatsu-city, experience design is utilized in the study phase of services and functions to be provided, mainly for the citizen's portal service, and it is realized to develop and provide measures based on the needs of users (Figure 5.2-8). Interview, persona analysis, and journey map are described here.

	Example
Examined Service	 • Portal service to provide personalized service/content to citizens (“Aizu-Wakamatsu Plus”) • Services specialized to resolve various issues actually provided by the portal
Targets for experience design framework	• Define targeted users • Specify everyday life scene in which each user senses issues, and grasp the needs therein • Examination of whether or not to implement a service, and of services and functions to be provided therein

Example tools/activities	• Interview
	  • Conduct depth interview and group interview for 7 people targeting “middle age generation with children” and “younger generation (university students)” in the initial phase of service review
	  • Depth interview of 1 to 2 hours, and group interview of 3 to 4 hours
	  • Directly collect real voices by gathering users introduced by employees, etc. of local companies
	• Persona analysis
	• Journey map, etc.

Figure 5.2-8 Overview of experience design application in Aizu-Wakamatsu-city

In the initial phase of the study for the portal service, the city selected the intended target of middle-aged women, university students, and others and conducted interviews regarding their communication points of contact with their surroundings with assistance from employees of local companies, etc. Figure 5.2-9 shows the result from the group interview of parenting women in their 40’s, among others. It shows that they are broadly picking up primary information with emphasis on the interviewees’ casual actions and emotions, with the people and institutions involved in their everyday life as the main thought starters.

[19] Experience design in Aizu-Wakamatsu-city: Created based on Information provided by Aizu-Wakamatsu-city

There are generally two types of interviews, namely, group interviews which bring together several people who have something in common at the same time, and depth interviews which allow deeper exploration of information on one-on-one basis. It is important to use them differently taking advantage of each method, since group interviews allow listening to various voices through synergistic effect of participants' discussions and depth interviews allows deeper extraction of psychology and thoughts.

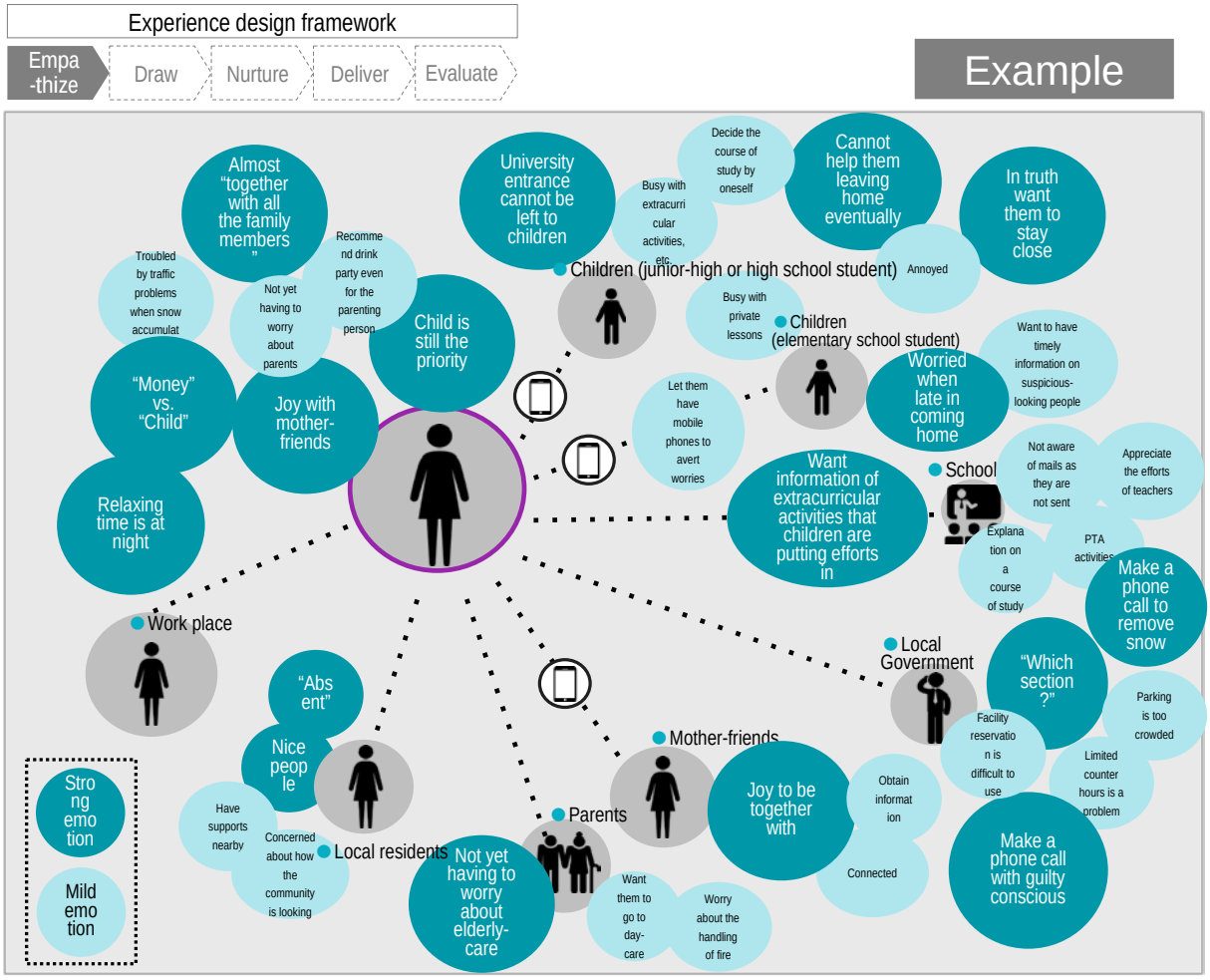


Figure 5.2-9 Example in Aizu-Wakamatsu-city: Interview

Based on the results from the interviews and other research, three specific target groups were identified to be focused for the initial design of the portal service in Aizu-Wakamatsu-city. Then, these users in each group are defined vividly as virtual persons and their current situation and value are described in such details as readers can empathize, as shown as an example in Figure 5.2-10. This is called persona analysis, and

it has the effect of creating a common mental picture among the parties involved and specifying points to be considered.

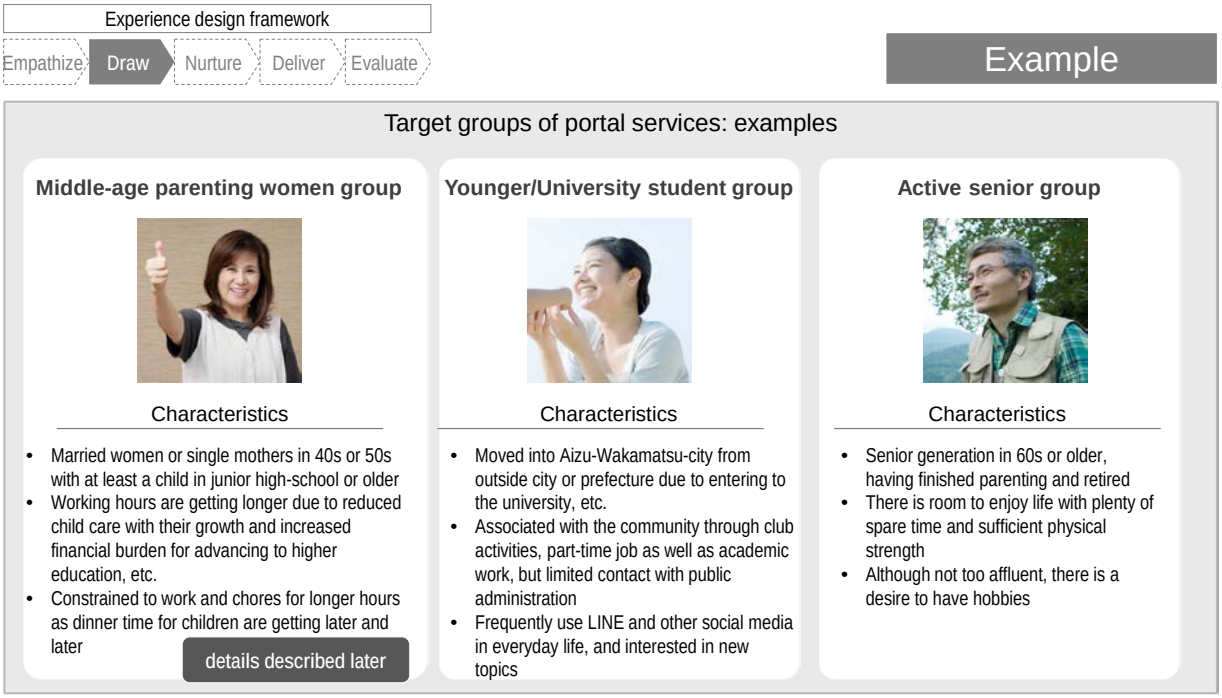


Figure 5.2-10 Example in Aizu-Wakamatsu-city: Persona analysis

In addition, Figure 5.2-11 shows a journey map, which organizes the expected needs and issues of the users of each group in their experiences related to the portal service as user journeys (experience flows). By organizing the service ideas for the portal by way of the journey map, it is possible to clearly see the end-to-end user experience in the use of the portal service and various services provided therein. Although not all of these services have been realized in Aizu-Wakamatsu-city, they are regarded as important tools for idea verification.

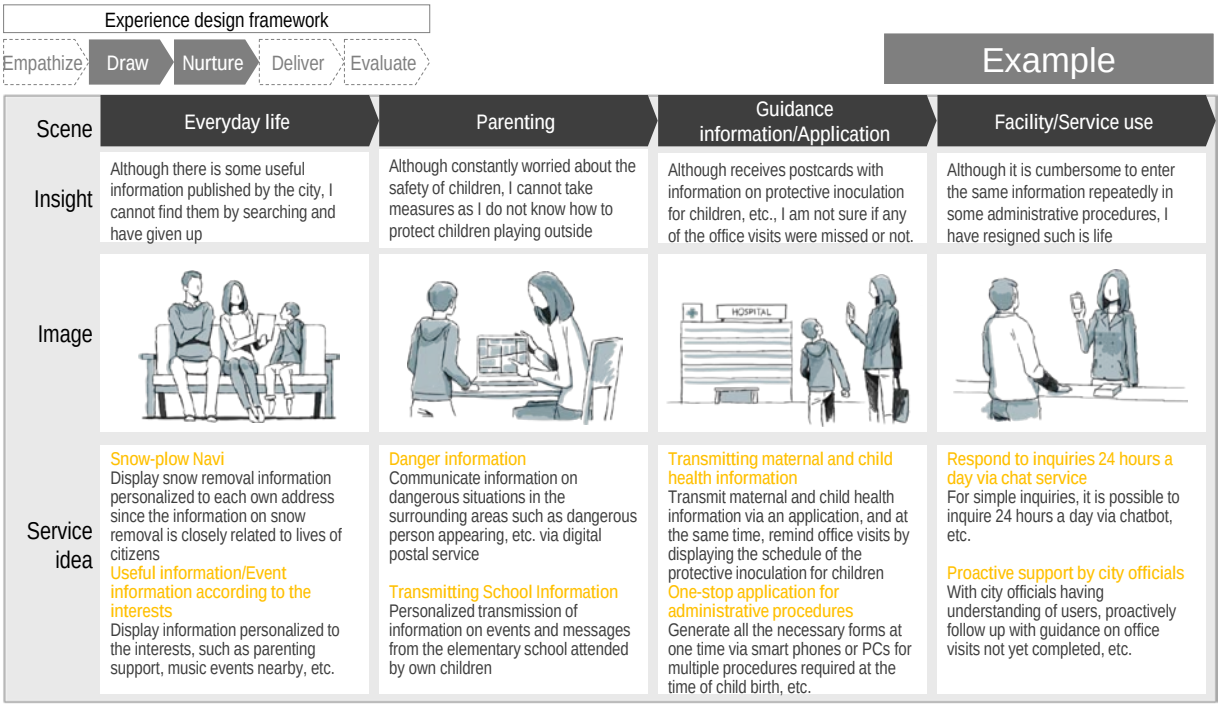


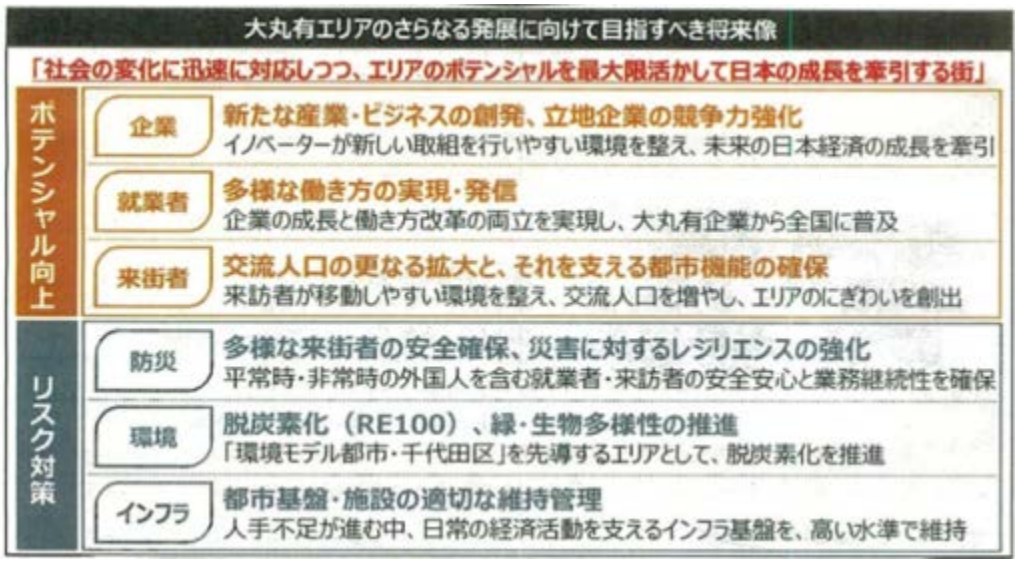
Figure 5.2-11 Example in Aizu-Wakamatsu-city: Journey map

5.2.5.2 Experience design in OMY District[20](Service design)

In the OMY District, the future vision towards further development of the District is set as a part of the initiatives for Smart City Model Project (2019) which is offered to the public by the Ministry of Land, Infrastructure, Transport and Tourism, and then the form of Smart City required to realize the future vision (what should be implemented as Smart City in the OMY area) is studied.

In the process of this study, the future vision that the area should aim for has been set from the perspective of the users of Smart City services. The users of Smart City services in the OMY area are companies located in the area, their workers, and visitors to the area (there are no residences in the area), the future vision has been set with these service users in mind, as shown in Figure 5.2-12.

[20] Experience design in the OMY District: Information source: OMY Area Development Council



大手町・丸の内・有楽町地区まちづくり協議会資料

Figure 5.2-12 Setting the future vision of the OMY area

In the OMY area, the OMY Area Development Council consisting of the landowners in the area is taking the lead in examining the Smart City initiatives, reflecting the opinions of the landowners who will also be service users.

Figure 5.2-13 shows the summary of service design applications in the OMY area.

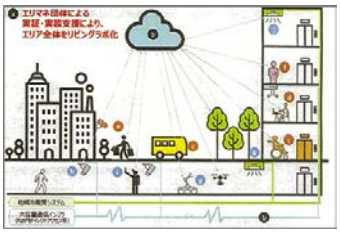
	Example
Review services	 Source: OMY Area Development Council • Provide profit services (in the fields of mobility, productivity improvement, health improvement, tourism, etc.) • Provide public services (in the fields of disaster prevention, crime prevention/security, energy, environment, etc.) • Establish infrastructure to support services
Target for experience design framework	• Define target users of services • From the perspective of each target, set a vision of the future the area should aim for • Deduce approach methods taking business potential, etc. of the services into account (Profit services: originate by taking the whole area as a living laboratory to enable trials of new products and services) (Public services: Promote smart transformation through collaboration of the area management entity and public administration)
Example cases of activities	• **Examine Smart City initiatives mainly led by the OMY Area Development Council** • Promote examinations by the organizations in which landowners of the area participate as service users, incorporate the needs of users

Figure 5.2-13 Overview of service design applications in the OMY area

One of the characteristics of Smart City initiatives in the OMY District is the existence of “Marunouchi Data Consortium” which is an initiative in collaboration with TMIP (Tokyo Marunouchi Innovation Platform). In order to enable participating companies and organizations to work through the complete process from idea creation to field test, “Marunouchi Data Consortium” holds workshops and seminars, provides data exchange and utilization infrastructure, supports data analysis by data scientists, and also provides channels of communication with various companies in order to support verification experiments and new business creation, as shown in Figure 5.2-14.

Figure 5.2-14 Data utilization steps in Marunouchi Data Consortium

As a specific example, for the purposes of deepening exchanges among member companies and creating service ideas based on the needs of workers in the region, the "Idea Creation Workshop" using the idea creation method IMDJ (Innovators Marketplace on Data Jackets)[21] is being held as shown in Figures 5.2-15 and 5.2-16.

More than 40 ideas have been created through workshops based on the data held by and issues of each company, and five concepts ("on-demand shared office", "urban space art festival", etc.: see Figure 5.2-16) have been visualized.

In addition, in order to verify whether or not the idea meets the needs of the people who make living in Marunouchi, "living lab"[22] has been established as an approach to

[21] IMDJ(Innovators Marketplace on Data Jackets) https://datajacket.org/about-imdj/

[22] Living lab https://recolab.rcast.u-tokyo.ac.jp

extracting the needs of these people. The needs are narrowed down through discussions, and along with the discrepancies from the preliminary hypotheses, the direction of the new services to be considered is formulated.

Figure 5.2-15 Establishing “Living Lab”, an approach to extracting the needs of the living people (1)

Figure 5.2-16 Establishing “Living Lab”, an approach to extracting the needs of the living people (2)

5.2.5.3 Experience design in Takamatsu-city, Kagawa Pref.[23]

In Takamatsu-city, Kagawa Pref., “Town Data Laboratory” is in operation as a citizen's course on creating ideas for data utilization through experience design. The "Town Data Laboratory" was designed as a place where citizens with diverse backgrounds could create prototypes (preliminary models of actual working services) of services which utilize open data (called data utilization services) based on their own perspectives, and where participants could evaluate each other's ideas using the developed prototypes. This course is jointly hosted and managed by Kagawa University, which has as one of its goals the development of local talents who can contribute to resolving local issues, and Information and Communication Exchange Center “eTopia-Kagawa”[24] which is an experience-based educational facility of Kagawa Prefecture, and has as one of its goals the improvement of ICT literacy of the citizens of the prefecture.

This course provides technical support to lower the hurdles for citizens to participate in Smart City. It organizes a set of programming libraries and sample applications (called prototyping support tools) to use the IoT common platform and reduces the difficulties associated with developing data utilization services. Anyone who is literate enough to use Microsoft Office in class, work, etc. can create a prototype, whether he or she is a working person, a student, or a high school student.

Figure 5.2-17 shows a citizen-centric Smart City promotion model which is the aim of this course. In this model, Kagawa University is taking the lead in developing Smart City applications and underlying technologies. These technologies are packaged as prototyping support tools and provided to citizens at “Town Data Laboratory”. To conduct the course, the IoT common platform provided by Takamatsu-city is used. With such support, citizens create ideas that contribute to the local region and nurture their own civic pride (love of the region). The higher is the civic pride, the stronger is the desire to participate in Smart City, and it is expected to result in the creation of a virtuous cycle (ecosystem) which in turn leads to further contributions to local regions.

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[23] Experience design in Takamatsu-city, Kagawa Prefecture: Information source: Takamatsu-city, Kagawa University

[24] https://www.e-topia-kagawa.jp/

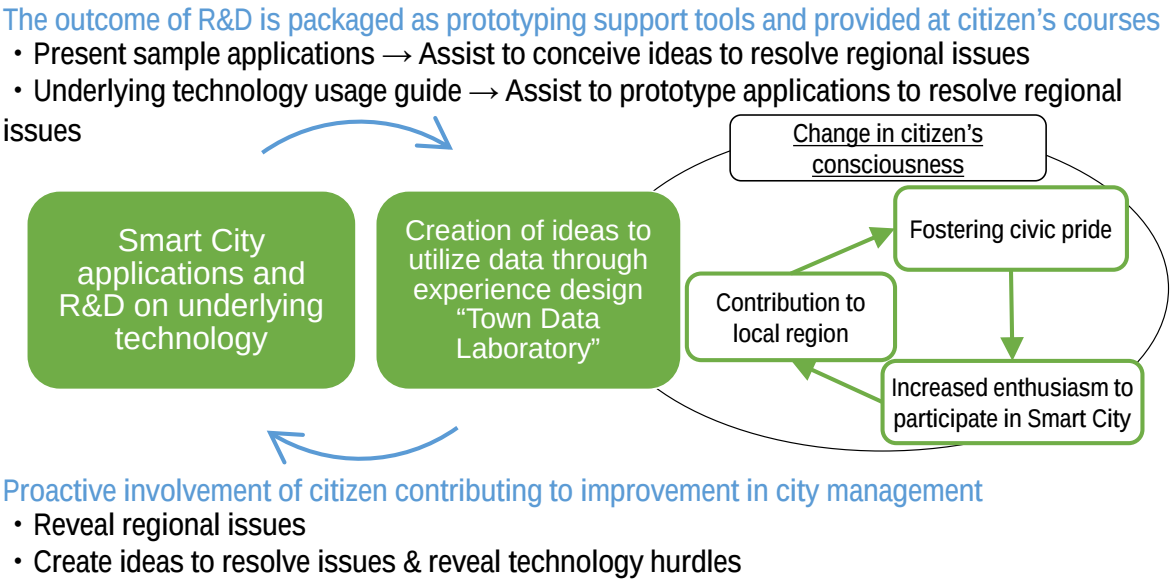


Figure 5.2-17 Citizen-centric Smart City promotion model based on experience design

It has been proven that "Town Data Laboratory" initiatives enable creation of a variety of ideas for region-based data utilization. [25] Figure 5.2-18 shows an example of ideas for resolving local issues which were actually conceived by citizens who participated in the "Town Data Lab" in 2018. [26]

Through the creation of prototypes, the applications realizable on the IoT common platform and the local issues familiar to the participants are connected, and the locations of street trees and the amount of fallen leaves collected are converted into open data and visualized for each region, all of which forms an idea to be utilized for reduction of the costs associated with collecting fallen leaves and creation of events in the local region.

[25] "Development of Data Utilization Personnel Training Program: Development of Support Environment for Prototyping Data Utilization Services and Its Implementation", Journal of Japanese Society for Information and Systems in Education, Vol. 37, No. 2, April 2020

[26] "Challenge! Open Governance 2018"
http://park.itc.u-tokyo.ac.jp/padit/cog2018/area/shikoku.html#takamatsu-shi

Figure 5.2-18 Ideas for resolving local issues by data utilization devised by citizens via the "Town Data Laboratory

There are a wide variety of other region-based ideas being created via the “Town Data Laboratory”. As Figure 5.2-17 shows, new Smart City applications and components are developed based on the ideas proposed by citizens for resolving the regional issues, and passed back on to the citizens. Figure 5.2-19 shows a data acquisition service (AI camera sensor-pod)[27] which was developed based on the idea of “an application to use sensors to acquire and visualize the liveliness of the region” proposed by “Town Data Laboratory” participants in FY 2018. This sensor-pod is designed to periodically measure the number of arbitrary objects in a photo taken by a camera and send it to the IoT common platform as needed. The IoT common platform is capable of retaining the status of the sensors and storing log data via various modules. Pictures and graphs in Figure 5.2-19 show examples of an application which measures the number of “people”. The pictures show how the sensor-pod is placed in the waiting area of the Takamatsu-city Hall Citizen Section and the graphs show changes in the number of people waiting in waiting area over time. The data show that Citizen Section is crowded when work begins in New Year and the degree

[27] Shikoku Information and Communications Technology Roundtable (http://shikoku-ict.jp/): AI camera sensor-pod for the construction of information security infrastructure for region open data

of crowdedness subsides towards the end of the same week. As shown here, the data acquired by the sensor-pod can be used for visualization in the form of graphs, etc. and analysis of peak period, etc.

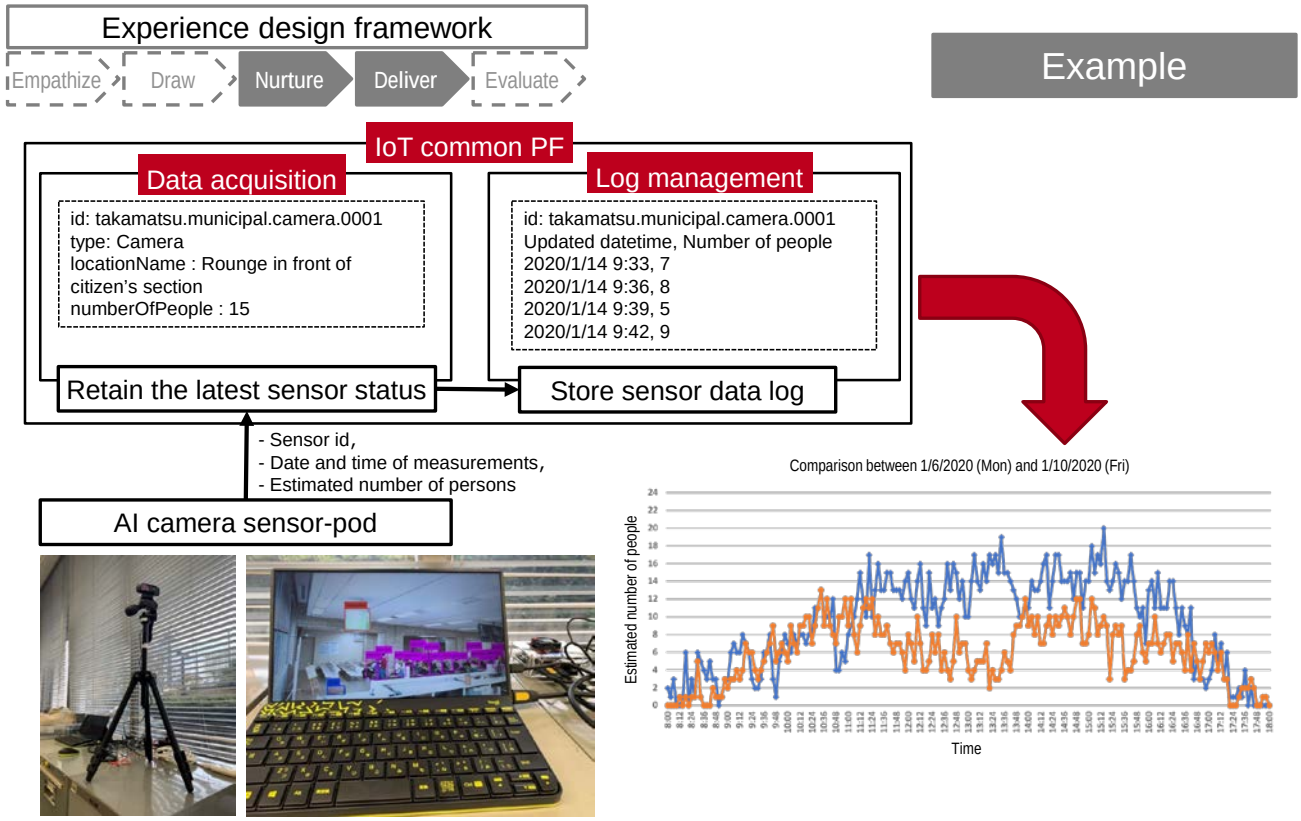
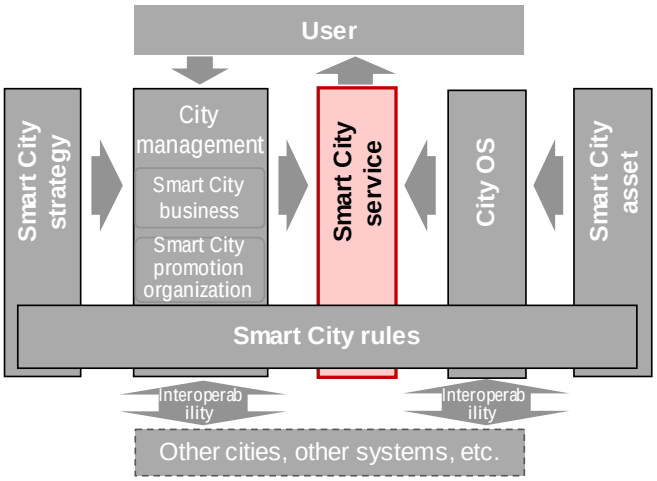


Figure 5.2-19 Data acquisition system (AI camera sensor-pod) developed from the idea of "Town Data Laboratory" participants

6. Smart City Service

6.1 Positioning of Smart City Service



Smart City service is defined as what is provided to users by federating and/or integrating data and other services via City OS. The most common example is the provision of services via websites and applications, where each respective service is provided on City OS while utilizing common services implemented on City OS.

Smart City services are derived from the set goals in the "Smart City Strategy" and "Experience Design". Because the strategies and goals differ from region to region, Smart City services are implemented in many different ways in each region, and it is difficult to define Smart City services in a uniform way. Accordingly, this chapter is limited to the presentations of some examples, and it is highly recommended to collect information on the latest successful cases, in addition to the examples in this chapter, in various ways and use them as references for the construction of Smart City services in one’s own region.

6.2Smart City service example

6.2.1 Aizu-Wakamatsu-city: AI Chat-bot service[28]

In Aizu-Wakamatsu-city, one of the sub-goals was set as making communication with the government easier, and the needs for routine and relatively simple inquiries were identified among others by conducting interviews with residents. As a result, it was decided to implement a service in which AI automatically answers questions by way of digital tools used by residents in their everyday life.

Specifically, it is a chat service utilizing the most widely used LINE: major social media in Japan service mainly targeted at the citizens of Aizu-Wakamatsu-city. When a user sends a question to the LINE account on the "Aizu-Wakamatsu Plus" from one's own digital device, AI analyzes the keywords therein and automatically responds with a reply. Currently, it is proceeding with the implementation of information which residents may need in their everyday life, such as information on the hospitals which are open during the holidays, information on how to dispose of garbage, and procedures for issuing various certificates, and there is a plan to continually increase available information by expanding the data federated in the background, and even to implement various application procedures themselves in the future.

[Measure]

AI-based digital government inquiry counter service

[Users]

Citizens of Aizu-Wakamatsu-city and commuters to and from work and schools therein

[Service provider]

Aizu-Wakamatsu-city

[Non-digital component]

Review and revision of AI response patterns as needed based on the status of use

[Digital component]

[28] AI Inquiry Service: Created based on the information provided by Aizu-Wakamatsu-city

The AI constructed on City OS deduces the corresponding data from what is pre-registered in the data infrastructure based on the message received from a citizen via LINE, and automatically responds to the citizen again via LINE

[Data utilized]

- Information entered via LINE by users
- Opening hours and location information of the hospitals in the city
- Operation status of snowplow trucks
- How to dispose of garbage
- Procedures for issuing various types of certificates, etc.

6.2.2 Takamatsu-city: Wide-area disaster prevention service[29]

With the underlying intentions to overcome declining population, improve regional vitality, and respond to rising risk of disaster, Takamatsu-city has been proceeding with the initiatives to realize Smart City since fiscal year 2017 under the theme of "sustainable regional development by the collaboration of industry-academia-private-public sectors" with the aim of resolving issues which cannot be resolved by the government alone.

As one of the Smart City initiatives, disaster prevention was characterized by the following issues.

- There is an urgent need for countermeasures against natural disasters such as the Nankai Trough Mega Earthquake, typhoons/torrential rains, etc.
- As there are workers and students coming from neighboring municipalities, rapid information sharing in collaboration with neighboring municipalities is required in disaster response
- With limited funding, the cost of implementing and operating IoT platform and services is a significant burden for the municipality alone

In order to resolve these issues, it has reached an agreement with neighboring municipalities to develop a wide-area rapid information sharing service in the event of a disaster, and been promoting the verifications of wide-area disaster prevention service, with plans to further upgrade the information sharing and responses in the future.

[Measure]

Provision of a wide-area disaster prevention service for the collaboration of wide-area disaster preventions with neighboring municipalities

[Users]

Takamatsu-city, and Ayakawa-cho, Kannonji-city

[Service provider]

Takamatsu-city

[Non-digital component]

Wide-area collaboration, and collaboration between departments in the municipality

[Digital component]

[29] Wide-area disaster prevention service: Information source: Takamatsu-city

Mechanism to store the data of Takamatsu-city and neighboring municipalities on the commonly-used IoT platform, and to display the shared data centralized on the common display screen

[Data utilized]

Road traffic information, weather information, and sensor information such as river water levels and tide levels

6.2.3 Sapporo-city: Kenko (health and well-being) point service[30]

In Sapporo-city, a low percentage of citizens regularly exercise, and its healthy life expectancy is at the lowest level among ordinance-designated cities. There has also been an increasing trend in the share of automobile usage with a higher environmental impact than public transportation.

Accordingly, in order to promote health by encouraging walking and to reduce the environmental impact by the use of public transportation, health promotion initiatives (Kenko Point) with the following characteristics were implemented as a trial.

- Implemented incentive granting promotion to incentivize walking based on the algorithm with proven effect. Achieved the targeted increase in the number of steps walked during the winter time.
- Obtained upon opt-in, as a counter-benefit to the granting of Kenko Points, various personal data (health, movement, number of steps walked, purchases, etc.) which are valuable for the health and regional development measures of Sapporo-city.
- Analyzed information, including information on the seamless movement of people above and under ground, from many different perspectives. Explored the possibilities of regional development related to the development of facilities and liveliness (smart planning).

[Measure]

Provision of Kenko point service which awards incentive points based on participants' activities and achievements (walking, improving health, participating in courses, visiting specific areas, etc.)

[Users]

Citizens of Sapporo-city

[Service provider]

Smart Wellness City Council

(main members: Sapporo-city, Nikken Sekkei Research Institute K.K., Tsukuba Wellness Research K.K.)

[Non-digital component]

Cooperative collaboration with the environment (underground space in Sapporo-city) and large-scale shopping malls

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[30] Kenko Point Service: Information source: Nikken Sekkei Research Institute K.K., Tsukuba Wellness Research K.K., Sapporo-city

[Digital component]

BLE beacons connected to smartphones and ultrasonic pedestrian flow sensors set in the underground space and the large-scale shopping malls

[Data utilized]

- Participants' Individual attributes (gender, age, health condition)
- Participants' activities and achievements (information on number of steps walked, places visited, purchase log, etc.)

6.2.4 Kakogawa-city: Citizen Safety-care Service (Safety-care Cameras & next generation Safety-care services)[31]

Kakogawa-city has initiated efforts to become “a city chosen by the parenting generations” based on the Kakogawa-city Comprehensive Strategy for Region/People/Jobs Creation, with safety and security as one of the main focuses of the city.

Based on the issues identified in the initial phase of the efforts such as the higher crime rate in comparison to the average of Hyogo Prefecture, and the wandering problem of the people with dementia, citizen Safety-care service is provided with the aim of 1) construction and operation of information infrastructure to enable region-wide Safety-care, and 2) study and implementation of smart services which contribute to the improvement of citizen services.

[Measure]

Implementation of Safety-care Cameras and next generation Safety-care services (Notification tags)

[Users]

Residents of Kakogawa-city

[Service provider]

Nikken Sekkei Research Institute K.K., Sogo Security Services Co., Ltd., Kakogawa-city, etc.

[Non-digital component]

Formulation and enforcement of “Ordinance on the Installation and Operation of Safety-care Cameras” for the installation of cameras, and compliance with Kakogawa-city ordinance on the protection of personal information (operated under stricter conditions)

[Digital component]

Safety-care Cameras in the city, smartphones (Kakogawa application), mail delivery motorcycles (vehicle-mounted IoT devices), Notification tags (BLE tags)

[Data utilized]

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[31] Citizen Safety-care Service: Information source: Nikken Sekkei Research Institute K.K., Sogo Security Services Co., LTD., Kakogawa-city

Image information via Safety-care Cameras, and Notification tag information via tag location detectors around schools, smartphones (Kakogawa application), and mail delivery motorcycles (vehicle-mounted IoT devices), etc.

6.3 List of measures for reference

In addition to the examples above, there are a wide variety of other types of services which could be implemented as Smart City services in each region. Some measures extracted from various examples of Smart Cities across the country are presented below as a reference for the services to be considered.

6.3.1 Theme: Promote settlement and fostering by attracting and supporting people

Category	Measure
Tourism	Provision of information such as tourist attractions and weather to tourists via web
Tourism	Multi-lingual tourist support via applications, etc.
Tourism	Route search on the web
Tourism	Capturing tourist dynamism from pedestrian flow data analyzed from camera images
Tourism	Improvement in attractiveness of tourism by streaming the live video of the tourist attractions
Tourism	Free Wi-Fi services for tourists
Health	Display and analysis of health data by measuring the amount of activities, etc.
Health	Management of health points, and visualization of health data
Health	Predicting the risk of developing high blood pressure by collecting and analyzing blood pressure data
Health	Central management on the cloud of consultations and examinations information including electronic medical records and medication handbook
Health	Comprehensive management of children's health records and biological data, and provision of childcare consultations based on the data analysis
Health	Assessing the risks of requiring nursing care and dementia by analyzing medical questionnaire information and measured vital data
Health	Prediction of potentially serious diseases based on the past medical data
Health	Presentation of routes for safe transportation by ambulance based on the road and weather information analysis
Education	Application-based home learning support, including recording, sharing and visualizing of learning data

Category	Measure
Education	Remote education utilizing web conferencing
Education	Remote education on programing
Lifestyle Convenience	Operation of the marriage partner search site, support marriage partner search by hosting events and seminars
Lifestyle Convenience	Provision of pinpoint weather information by collecting information from environment sensors, etc.
Lifestyle Convenience	Making public services more efficient and advanced by providing information on parenting and sorting garbage, etc. and collecting citizens' voices, etc.
Lifestyle Convenience	Provision of real-time information such as detailed information of the facilities and congestion information thereof, information on toilets availability, etc.

6.3.2 Theme: Securing quality & quantity of employment and economic development

Category	Measure
Agriculture	Advanced management of fishery resources by collecting water temperature and water quality information for each area and understanding it as map information
Agriculture	Prediction and notification of harvest timing and damages from diseases and insects for the purpose of improving crop quality by collection and analysis of water temperature and water level data
Agriculture	Collection and management of data from the tide direction and velocity sensors of observation buoys and onboard GPS sensors to promote safe operations
Agriculture	Centralized management of meteorological data, marine data, catch data, and underwater image data for the purpose of improving fishing efficiency
Agriculture	Monitoring and centralized management of water temperature, water level, temperature, and humidity by paddy field sensors for the purpose of improving productivity in paddy fields.
Agriculture	Accumulation of information obtained from the installed sensors for detecting and trapping harmful birds and animals
Logistics	Optimization of distribution routes by analysis and visualization of collection locations and piling up conditions
Logistics	Analysis of the best collection and transportation route and loading rate improvement by image data analysis
Productivity	Understanding the usage level of governmental services utilizing individual identification card, etc. for the purpose of digitization of the government
Productivity	Improvement of productivity, working environment, etc. of factories utilizing IoT
Productivity	3D conversion of planar images by three-dimensional shape restoration calculation for the purpose of improving productivity in surveying
Productivity	Digitalization and accumulation of process-related information for the purpose of improving the efficiency of process control and paperwork tasks
Productivity	Business productivity Improvement such as reduction of travel expenses utilizing web conferencing, etc.
Industrial development	Conversion of open data into portal and visualization for the purpose of developing local industry

Category	Measure
Industrial development	Analysis of food purchase data for the purpose of supporting demand creation and new product development
Industrial development	Operation of regional points and regional currency valid for use only within the region
Industrial development	Hosting of ideathons, hackathons, and contests in which groups of people exchange ideas on specific themes
Industrial development	Converting vending machines to be equipped with digital signage functions

6.3.3 Theme: Enhancement and revitalization of functions and environment of the region

Category	Measure
Disaster prevention	Maintain electrical power supply to evacuation shelters and local disaster prevention centers utilizing in-house generator facilities, rechargeable batteries, etc.
Disaster prevention	Determine evacuation routes during disasters by capturing crowd flow and congestion levels
Disaster prevention	Detection of water level rise by collecting sensor data of rivers and waterways
Disaster prevention	Detection of predictive signs of landslide disasters by collecting sensor data of landslide disaster risk areas
Disaster prevention	Provision of drinking water in the event of a disaster utilizing vending machines in the area
Disaster prevention	Publishing hazard maps, evacuation shelter maps, evacuation routes, etc. on the web sites
Energy	Analysis of the supply and demand of electrical power in the region by EMS, and flexible adjustment of energy based on the analysis.
Energy	Integrated management of energy consumption by customers
Energy	Management of electrical power consumption and suppression of electrical power demand by notifying customers
Energy	Prediction of electrical power demand based on data from weather forecasts, motion sensors, etc. and automatic control of air conditioning and lighting equipment of customers
Transportation	Provision of optimum route, traffic information, and services appropriate for the usage models
Transportation	Improvement of bus schedules and routes by collecting and analyzing the data from sensors installed on the buses
Transportation	Provision of street information held by the city to the public via API
Transportation	Provision of buses, car sharing, and on-demand buses
Transportation	Provision of bus services utilizing autonomous driving (verifications)
Transportation	Display of parking space availability information on the web site, and guidance to vacant parking spaces
Transportation	Isolation of traffic accidents prone locations by means of collection and analysis of drive records information

Category	Measure
Transportation	Collection, analysis, and publishing of road information by means of citizens' posts on social media, cameras, etc.
Transportation	Visualization of traffic volume, gender, and age group by the analysis of images from pedestrian flow cameras
Transportation	Provision of rental bicycles for citizens and tourists
Security	Confirmation and notification of children's location when they leave school, etc.
Security	Visualization and publishing of a location where a bear is spotted on a map on the web site
Security	Support for the safety-care of the elderly by analyzing water and electricity usage, life logs, GPS, etc.
Security	Implementation of information trust functions of personal data management, confirmation, management of provision to third parties, etc.
Sustaining infrastructure	Display of locations information and snow removal routes of snowplow trucks equipped with GPS, and management of work and complaint requests
Sustaining infrastructure	Monitoring of road conditions using IoT and cameras, data analysis, and output onto maps
Sustaining infrastructure	Collection of reporting data on infrastructure restoration from social media posts by citizens, and displaying on a web map
Sustaining infrastructure	Matching making between volunteers and people who request assistance with snow removal
Sustaining infrastructure	Installation of advanced street lights equipped with dimmer control by motion detectors, Wi-Fi, digital signage functions, etc.