Proposals and practices for regional resource revitalization for tourism promotion by promoting citizens' health and open data promotion

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Abstract
This study proposes a plan for Suzaka in Nagano Prefecture, Japan, to revitalize tourism by promoting citizens' health using open data. The proposal connects and promotes regional resources through digital transformation tools and technologies that leverage open data to engage, educate, and empower residents and visitors alike. At its foundation are actions, applications, initiatives, and policies that have been proven to stimulate health self-efficacy, bolster tourism, and invigorate regional resources through the synergy effect of collaboration.

Keywords
open data, health promotion, regional computerization, regional resource revitalization, tourism promotion

1. Introduction

Until 2020, tourism in Japan was one of its critical policies in the 21st century. According to the Japan Tourism Agency, the Tourism Nation Promotion Basic Law (Act No. 117), revised in 2012, established tourism as one of the pillars of Japan's growth strategy, pledging to increase domestic tourism by 30 trillion yen and the number of international visitors to 18 million. The Law stipulated that the responsibilities of local governments included formulating and implementing policies that would take advantage of local attractions and characteristics and co-operate in area-wide collaborations. In addition, in conjunction with the regional computerization policies of the Ministry of Internal Affairs and Communications, local governments are now required to establish information circulation structures to use and distribute regional information technology (IT) and leverage information and communication technology (ICT) and the Internet of Things (IoT) to create and promote regional attractions.

However, the widespread infection-prevention measures necessitated by the COVID-19 pandemic have created an unprecedented crisis in the tourism sector. International travel has been significantly curtailed, and citizens have been asked to exercise voluntary restraint from travel and non-urgent outings to prevent the spread of the virus.

In response, the Japan Tourism Agency is currently promoting tourism service reforms and stimulating tourism demand through digital transformation (DX). This entails creating new sightseeing content and value using combinations of tools and technologies of what the Japan Business Federation has called Society 5.0, in which people leverage imagination and DX to solve problems and create value. In this context, Japan's tourism sector has turned to tools and technologies such as the internet, electronic devices, videos, virtual reality (VR), and an ever-increasing array of software applications.

This study focused on connecting the regional resources unique to Suzaka with digital data and technology by linking the municipal agencies' health promotion measures with regional computerization and open data promotion in Suzaka. This initiative aims to revitalize regional tourism and resources and, at the same time, promote citizens' health and well-being.

2. Regional resources and health promotion

2.1 Suzaka's resources

Located in the northern part of Nagano Prefecture, Suzaka flourished in the Meiji period thanks to the silk industry. Earthen storehouses reminiscent of the prosperity of those days remain in the city known as the "town of kura (storehouse)." It is also known as "Fruit Hollywood" for its profusion of grapes, apples, and peaches, which thrive thanks to the area's well-drained soil and clear water, large temperature range from day to night, and low precipitation levels. More than 50 traditional vegetables and local varieties grow in the prefecture, including Numameshirouri, Hacchokyuri, and Murayama wase gobo, supported by efforts to pass them on as living cultural assets. Suzaka also has a vibrant brewing industry, including miso and soy sauce, attracting attention to the health effects of fermented foods. Thus, tourism promotions have included "hands-on" events for tourists to make miso.

2.2 Health promotion efforts

In 2015, Suzaka launched the Suzaka JAPAN project, promoting the city's record for good health and longevity. This was part of a regional revitalization project by the City Hall Health Promotion Section and included initiatives to promote its citizens' health. The project goals include revitalizing the community by connecting citizens with the treasures of hon-

mono (authentic experience) and creating new value, focusing on health promotion.

Nagano Prefecture is known as the best place to enjoy healthy longevity in Japan. Suzaka has the lowest certification rate for long-term care and insurance premiums out of 19 cities in the prefecture. It has so far produced about 7,000 health guidance workers who play a role in health maintenance and promotion. In this project, local government officials collaborate with local farmers, businesses, and citizens to promote citizens' health through exercise and a healthy diet using Suzaka's unique resources and rich natural environment. The project has three variations on its logo design (Figure 1), which combines the city's tortoiseshell crest (the tortoise is a symbol of longevity) with red, black, green, purple, yellow, and white hexagons arranged in a circle. Each color represents a characteristic or attraction of Suzaka that promotes healthy longevity.

Figure 1: Suzaka JAPAN's logos

3. Regional computerization in Suzaka

3.1 Opportunities for promoting open data

In 2014, Suzaka was the first municipality in Nagano Prefecture to commit to promoting open data, after participating in the annual International Open Data Day (IODD) held simultaneously around the world. This led to the establishment of the Open Data Promotion Council and the Open Data Promotion Declaration website. Suzaka also participated as a member when the regional open data promotion council of Shin-Etsu General Communications Bureau was established as a base council in Nagano and Niigata Prefectures in 2015. Also created that year was the Chikuma River Open Data Valley Initiative, which aimed to promote area-wide collaboration among Nagano, Chikuma, Nakano, Obuse, and Suzaka.

3.2 Open data promotion initiatives

Until now, Suzaka has promoted open data in collaboration with the authors' research group, working with the original section and related facilities, such as the Suzaka City Zoo (under the Community Development Division's jurisdiction), the Natsubata Regulation Office for Buried Cultural Properties (under the Lifelong Learning and Sports Division's jurisdiction), and the Suzaka City Technical Information Center (under the Industrial Cooperation and Development Division's jurisdiction), driven mainly by the Policy Promotion Section of the City Hall. We identified four types of efforts.

The first is open data promotion through citizens' initiatives in which citizens discuss local problems and issues, create data-based solutions, and make proposals to the city. In this system, citizens, rather than the government, bear most of the burden of finding solutions. Suzaka joined IODD, which served as the trigger for the city to engage with open data promotion, at the invitation of a civil society group called "The Society to Consider the Informatization of Suzaka City." At the event, an idea session on what could be used as open data in Suzaka was held mainly with citizens who participated in the event. After the event, Suzaka announced its Declaration for Promoting Open Data.

The second type is application development using open data by city staff. In Suzaka, examinations of data disclosure, the publication of open data at citizens' requests, and application development are all carried out by municipal office staff. To date, 17 types of open data products have been developed and released. These have mainly been applications using data unique to Suzaka, including Suzaka Citizen Bus (a search application for bus services) and Bear Eyewitness Information, which maps the location of black bears seen in the city's vicinity.

The third type is open data and IoT. Suzaka has installed terminals (beacon) at 128 locations in the city, such as municipal facilities, tourist spots, and private shops. Each beacon's ID and information relevant to its location have been released as open data (Figure 2). One application using the beacons is the Suzaka City Zoo Treasure Hunt, which was jointly developed by our research group, the Suzaka City Zoo, and the Suzaka City Policy Promotion Division. It uses the 29 beacons installed in the Suzaka City Zoo. There is also a Children's Programming Class where children learn using microcomputers and text drawn from open data. The class, held by the Suzaka City Technology Information Center, promotes the human resource development that will carry the region (and IT) into the future.

The fourth type is open data and monozukuri. In fiscal year 2015, the city hosted an event in which the.stl data from high school students' and other participants' CAD drawings were fed as open data into a 3D printer to produce stamps. In addition, at the IODD held in the same year, we utilized 3D printer figures of open data of animals. Initiatives using laser cutters have been pursued since 2016. Suzaka City Zoo publishes drawings by the zookeepers and visitors at the event as open data to create period-limited novelty goods, using data and a laser cutter to create ornaments to decorate the zoo.

4. Promoting open data through health promotion

4.1 Proposals for regional resource revitalization

To develop its health promotion efforts into a regional resource that will enhance tourism, Suzaka needs to accomplish three goals.

- Turn local resources into open data:
  The information that Suzaka has published as open data so

Figure 2: Beacon information published as open data

far includes a timeline of the city's history, information about parking at the scenic Yonago Falls, the original illustrations and photographs of Suzaka City Zoo, quizzes, in addition to information such as the city's population by administrative district, evacuation sites, and where to find automated external defibrillators (AEDs). Since local resources are considered attractions, promoting the city's open data on health promotion should enhance the area's attractiveness and promote tourism.

- Develop tools using open data:
  The city needs new digital tools that promote citizens' health and educate locals and visitors alike about relevant events and local resources. The city should also collaborate with like-minded groups and other local governments with similar regional resources to develop activities that connect people throughout the region and beyond based on shared interests, disseminating ideas and information in easy-to-use open data applications.

- Sponsor municipal events and activities:
  The city could promote the community's attractiveness and citizens' health by developing creative ways and venues to share relevant open data. To engage local citizens and would-be visitors, they should introduce and promote projects, special events, and practical applications that encourage people to interact and engage with each other and the city's resources throughout their daily lives.

By incorporating the three goals necessary to promote both citizens' health and tourism, this study developed the proposal outlined below for local groups and governments to implement.

4.2 Healthy walking application

Suzaka recently published the application Suzaka and Takayama Health Walking, which promotes citizens' health. This application was jointly developed by our research group, the Suzaka City Health Promotion Section, and the Suzaka City

Policy Promotion Section. Like the Suzaka City Zoo Treasure Hunt, this application uses city beacons and their open data. From the standpoint of informing and promoting the activities of citizens and tourists, municipal staff selected the location and set up the beacon, while our research group developed the application. This application creatively encourages users to engage with all 128 of the city's beacons in museums, zoos, restaurants, shops, and other public locations. It provides health information while serving as a sightseeing application to guide users around the city and providing collectible digital stamps.

4.2.1 Application features

- Automatic check-in and calorie tracker:
  The application allows users' smartphones to receive signals sent from the beacons. It automatically checks in when users walk into the beacon's range and have the application switched on. The application uses the distances the users have walked to calculate and display the approximate number of calories burned (Figure 3). It also allows users to share

Figure 3: Automatic beacon check-in (left); automatic calorie counter (right)

their calorie information with other users as a way of encouraging them to continue walking. When used as a sightseeing application, it locates beacon spots on a displayed map, guiding users from their current location to other sightseeing spots, promoting the area's lively offerings and attractiveness.

- Walking map:

The application includes a pedestrian map that shows users various walking routes published by the Suzaka City Health Promotion Section (Figure 4). The map divides the entire city into 27 areas. The descriptions for each walk contain information on the total distance, estimated walking times from point to point, estimated calorie expenditure, basic tips on and knowledge about walking, and spots to enjoy. By making the map information already published by the city easily accessible, the application encourages people to enjoy the city's sites while also benefiting their health and fitness.

Figure 4: Walking map

4.2.2 Simple data management

The information displayed on the application screen must always be up-to-date and accurate so that users perceive it as valuable and practical. To ensure continuous operations without overburdening the data administrators, the application uses LinkData.org, an open data support platform, for data management. Administrators can update the application by revising and uploading data (e.g., beacon location) in an Excel format, enabling city staff who may not be IT experts to manage the data (Figure 5). The use of Linkdata.org has changed the management operation of applications linking the city's businesses and users, allowing for stable operation that is not heavily impacted by management budget. This method was also used in the Suzaka City Zoo Treasure Hunt, meaning that the method has been proven to minimize the administrators' burden during updates.

4.3 Healthy walking gadget

Our research group, the instructor of the city fitness gym, the Suzaka City Health Promotion Section, and the Suzaka City Policy Promotion Section jointly developed a walking gadget called Suzaka Slojog-kun, which helps users maintain a specific walking speed. The gadget epitomizes Suzaka's commitment to the Open Data–IoT and Open Data–Monozukuri initiatives promoting open data. To further enhance these features, municipal staff and local children made the case and programming of the gadget under the guidance of our research group. We handled the development using electronic components as it required expertise. With the hand-held gadget, users receive feedback and instruction on the walking method called "slow-jogging" at city events (Figure 6). It is also a novelty goods item for citizens who have achieved a certain health goal. The gadget was named by the same city fitness gym instructor that co-developed the slow-jogging method.

Figure 6: People at a slow-jogging community event

Figure 5: Excel data uploaded to Linkdata.org

4.3.1 The gadget's function

With Suzaka Slojog-kun, users can maintain a constant slow-jogging speed as the app provides regular rhythmic sounds (like a metronome) with audio alerts. The feedback allows users to maintain their individual optimum pace. Distractions can alter slow-joggers' pacing. The gadget helps them achieve the maximum cardiac, respiratory, and circulatory health benefits.

4.3.2 Development ingenuity

The casing of the gadget was developed using a laser cutter at the Suzaka City Technical Information Center, with the staff of the Health Promotion Section operating the machine (Figure 7). The program code was developed based on the code inputted by young students using Suzaka Children's Arduino Recipes Level of Detail (LOD), published at Linkdata.org under Children's Programming Class and held at the Suzaka City Information Center (Figure 8). Both were jointly developed with technical guidance from our research group. Children involved with the Suzaka Slojog-kun gadget learn about IT, programming, open data, and collaboration, enabling them to improve the local community and its citizens' health.

Figure 7: A Health Promotion Section staff member works with the laser cutter

Figure 8: A participant in a Children's Programming Class inputs program codes

4.3.3 Improving function and design

The gadget's developers incorporate feedback from lecturers and users who use it in the slow-jogging instruction class. To date, this has prompted four functional and design improvements.

- Added timer
  The initial version established the rhythm from when a user pressed a button until they pressed it again. However, a timer was added after user feedback suggested that users might develop a better sense of time if the alert stopped automatically after one minute.

- Changed case size and color
  In keeping with open data and the monozukuri concept, the original gadget had a transparent acrylic case to attract interest and make it easy to understand the mechanism. However, to increase public awareness of the Health Promotion Section's health promotion projects, we changed to an opaque case with the Suzaka JAPAN logo to reinforce the gadget's message of health and longevity. Subsequent versions came in different colors and were 30% smaller to make it easier to hold (Figure 9).
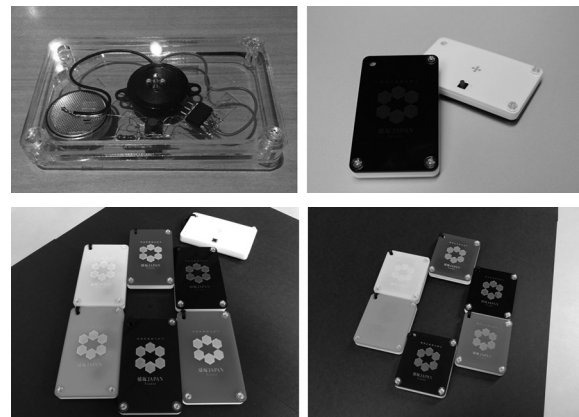

Figure 9: Design evolution of the Suzaka Slojog-kun

4.4 Shokuiku luncheon mats

Elementary schools in Suzaka City hold Shokuiku classes for parents and third-graders to teach them about the importance of breakfast, the essentials of nutritional balance, and healthy ways to cook local vegetables. Originally, the classes distributed a Suzaka luncheon mat to the participants illustrating the nutritional balance of cooked dishes, but budget constraints made it impossible to secure enough mats. However, using open data enabled us to develop and produce and distribute sufficient mats with lower production costs.

4.4.1 Luncheon mats open data development

To produce the new luncheon mats, we began with an original illustration of Shokuiku drawn by the Health Promotion Section staff and turned into open data following these steps. During this process, our research group provided guidance on how to digitize illustrations and creating data.

- Create an illustration using pen on paper.

- Digitize the illustration using a scanner and publish it as open data (CCBY Suzaka JAPAN).
- Import the open data into a computer and finalize the design.
- Submit the design to a vendor for printing on cloth and sewing.

All these steps, from illustration design to printing and sewing, were previously commissioned to contractors. However, we reviewed what we commissioned for each step, and the Health Promotion Section staff took on additional tasks such as converting illustrations into open data and preparing source data based on them. This resulted in a reduction in usage fees of illustrations and the amount of commissioning is now minimized through the use of open data. As a result, we could produce the necessary amount at the minimum cost. In reference to steps carried out by the Health Promotion Section staff, it was ensured that local authorities and communities interested in shokuiku could replicate our work easily using regular equipment.

4.4.2 Design ingenuity

The Shokuiku luncheon mat illustrations used different colors for each nutrient: yellow for grains, red for proteins, and green for vegetables and fruits. If you arrange your tableware so that the ingredients of the dish match the illustration, you can check whether the nutritional balance of the meal is suf-

ficient. The fruits depicted in the upper left include grapes and apples; Nagano Prefecture is one of the top producers of grapes and apples in Japan, a specialty of Suzaka. Using open data enabled the Health Promotion Section to create a luncheon mat that promoted health and local produce (Figure 10).

4.5 Published recipes for health and longevity

One Suzaka JAPAN initiative promoting the city's association with health and longevity is the "Sunday Health Support Class in Suzaka," held on the last Sunday of each month. The class offers guidance on exercise, healthy food, and suggestions for ensuring long, healthy lives. Instructors lead exercises, give lectures, and demonstrate and promote the city's walking application and the Suzaka Slojog-kun gadget. Citizen groups and nutritionists teach people about the importance of a healthy diet based on the nutritious foods produced locally, holding cooking classes using local agricultural products, such as traditional vegetables from Suzaka.

The recipes of dishes such as oyaki were publicized at events and available as printed booklets (e.g., Health and Longevity Recipe Collection and Shinshu Suzaka Health Smoothie Recipe Book). However, to make it available to those who were interested in the topic but are unable to attend the events, and to develop wide collaboration with other local authorities with similar local resources, it is published as open data (CCBY Suzaka JAPAN) available at Linkdata.org (Figure 11). When publicizing the data, our research group provided advice to help promote use and application in municipal projects as well as boost the image of the city.

Figure 10: Luncheon mat (top) with open data illustration; the mats in use at events (bottom)

Figure 11: Publication of Suzaka City's original health and longevity recipe as open data

These data are unique to Suzaka as seen in the Suzaka–Takayama beacons, the Suzaka Children's Arduino Recipes LOD classes, and the Suzaka JAPAN luncheon mat project, which have already been published in addition to the appeal of a city of health and longevity (Table 1).

Table 1: Data sets related to public health promotion (CCBY Suzaka JAPAN)

Data Set Name	Similar data available?
Suzaka–Takayama Beacon Platform	None
Suzaka Children's Arduino Recipes LOD	None
Shokuiku luncheon mat illustration of for Suzaka JAPAN Project	None
Suzaka JAPAN Health and Longevity Recipe Collection	Yes
Shinshu Suzaka Health Smoothie Recipe Book 2018	None
Shinshu Suzaka Health Smoothie Recipe Book 2019	None

In the future, while making use of digital technology in cooking-related data, we hope to find new ways to showcase local produce and local healthy cooking recipes to give residents greater opportunities to learn about Suzaka and to encourage others to visit the "city of health and longevity."

5. Discussion

We proposed and demonstrated how open data can be used to link health promotion to regional resources and promote area-wide collaborations that benefit Suzaka's citizens and help revitalize the city's tourism sector. We demonstrated how digital tools and technology, such as applications and gadgets, can aid health promotion and increase the popularity and use of local resources unique to Suzaka. We observed how open data can be leveraged to achieve multiple beneficial goals, such as improved citizen health, increased demand for local agricultural products, publicity for the city's natural and manmade attractions, enhanced regional collaboration, public education and engagement, and a reinvigorated tourism sector. Furthermore, we discuss additional ways to further improve the attractiveness of Suzaka and develop its tourism sector below:

• Expand the scope of promotions

Open data promotion measures have been taken and coordinated with the health promotion measures developed by the city's Health Promotion Section. However, the city should expand on this and have open data promotion measures include other themes and topics in order to capture the attention of would-be visitors. In addition to promoting health, "Suzaka and Takayama Health Walking" also serves as a local sightseeing app. The walking gadget "Suzaka Slow Jog-kun" and the Shokuiku luncheon mats utilize Suzaka's open data and promote people's interest in the city's tourism resources, prompted by health promotion. It is necessary to link these to more reliable tourism promotion in the future.

Such measures will involve increased regional collaboration and the creative use of a broader range of open data on the city's natural and manufactured resources and attractions. Since good health and longevity have been associated with a high quality of life, the city could highlight its many local attractions (e.g., Garyu Park, Yonako Falls, the Suzaka City Zoo), its history of economic health (e.g., industry, agriculture), and its strong regional ties.

• Expand collaboration and development

Until now, the development of tools, such as the walking application, and gadgets has been tackled primarily by the authors' research group and the city hall. Moving forward, the city will need to recruit a broader variety of people and areas of expertise, such as more city departments, schools, businesses, organizations, academics, purveyors of arts and culture (e.g., art galleries, museums), health and safety experts (e.g., elder care, disaster response), citizens of all ages (individuals and groups), as well as other interested citizens. We believe that comprehensive efforts from various perspectives enthuse, educate, and engage the local community, which will attract visitors eager to experience the city.

• Expand information sharing

All local resource data was converted to open data and uploaded on Linkdata.org so that we could partner with local authorities and others with similar resources in need of such data. In the future, it will become necessary to share the know-how of tools and applications development and use websites for sharing and using open data. The city will need to devise ways to collaborate with other municipalities and regions interested in Suzaka's methods and approaches.

6. Conclusion

We discussed how digital technology and open data can link health promotion efforts in Suzaka to its unique regional resources, and simultaneously promote health, local attractions, and tourism. We used real-life examples with the results of empirically tested research to underpin the effects of the synergy between cooperation and teamwork. Thus, the original data of the local resources that form the basis of Suzaka's tourism resources were released as six open data sets in the areas of exercise and Shokuiku. Of these, five are original data sets of high value unique to Suzaka.

In addition to digitizing information about local resources and turning it into open data, the development and usage of tools using such data in municipal projects added a process of digital confirmation of the health promotion methods that the city is using. The methods of the self-management of participants' health can now be visualized more concretely.

Using our results as a catalyst, we will continue our open data research and expand our efforts to further the city's overall development and tourism revitalization efforts. We will explore new ways to leverage open data for diverse projects that promote Suzaka and its message of health and longevity.

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