Factors Influencing the Development of Rural e-Health Activities: A Case Study of Tono City, Iwate Prefecture

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1. Introduction

Information and communication technology (ICT)—including the Internet and mobile phones—has made remarkable progress since the 1990s as our information-based society has developed. The Japanese government has proposed Society 5.0, envisioning a society that maximizes the use of ICT for the enjoyment and convenience of all citizens. However, in rural areas, aging and population decline are accelerating over rates observed in cities. Therefore, it is crucial to revitalize the agriculture industry and create a conducive environment for farmers to continue living in these areas. This need has inspired efforts to maintain and strengthen medical care, welfare, education, and transportation services using ICT.

Onizuka (2015) argued that ICT held greater potential benefits for rural residents than urban areas. Examples of potential ICT applications in rural—and often disadvantaged—areas include online shopping, online sales, daily communication, distance education, information dissemination, and medical and nursing care. ICT could be a convenient means of improving multiple facets of daily life.

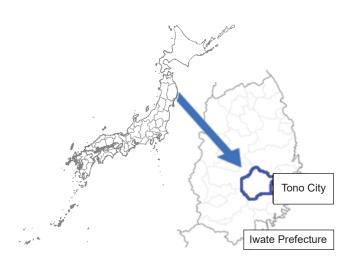I sought to clarify the development process and factors underlying health promotion activities using ICT implemented by Tono City, Iwate Prefecture, beginning in 2008. Through interviews with Tono City staff and business stakeholders conducted in 2020–2021, I examined how social and technological factors affected activities aimed at improving the health of local residents.

Figure 1. Location of Tono City, Iwate Prefecture

2. Process for Developing e-Health Activities

Tono City is inland in the southeastern part of Iwate Prefecture, with the Tono Basin extending through the center of the city (Figure 1). The climate in the basin is unique, characterized by severe temperature differences, with winter minimums occasionally dropping below −10 degrees Celsius. The region's economy centers around agriculture, including cultivating vegetables, hops, and other industrial crops, focusing on paddy rice. However, a significant decline in the number of farmers in the region poses a major challenge. The area has also seen a marked decline in practicing physicians. Thus, the progressive depopulation of rural regions has led to uneven distribution of healthcare professionals nationwide, raising concerns about the health of the elderly population.

Table1. Overview of e-Health Class

	Formative period	Prevalence period	Development period
Years	2008-2010	2011-2015	2016-2021
Districts	2 districts → city-wide	city-wide	city-wide
Activity base	7 → 17	17-22	12
No. of participants No. of business sites	150-404 n/a	366-471 n/a	471-1,477 11
Participants' interest in health	Some residents' health consciousness begins to change	Health-conscious residents participate and develop exercise habits	More residents develop exercise habits and recognize self-monitoring

In response to these challenges in 2008, the city administration launched an e-health consultation system called "e-Health Class" directed at elderly residents. Under this system, local residents visit the district community center once a week to undergo blood pressure tests. These data and pedometer data are stored on a secure server, and the patients are referred for health consultations based on ongoing monitoring of this data [1].

The e-Health Class is an important example of leveraging ICT to promote health and well-being. e-Health resource development can be divided into three phases: the formative period, the dissemination period, and the development period (Table 1).

(1) Formative Period (2008–2010)

In 2002, there were no longer any medical institutions offering obstetrics services. Therefore, in 2007, Tono City Midwifery Hospital was established to facilitate remote prenatal checkups. Additionally, due to the absence of full-time cardiovascular specialists, beginning in 2008, the project started connecting physicians practicing in Tokyo with local medical institutions and nurses. This marked the inception of the e-Health Class. However, it's worth noting that Tono City had limited information and communication system infrastructure during this period, primarily centered around Tono Station. Consequently, this project was initially rolled out in two central districts within the city with support from national ICT utilization project subsidies. Additionally, 2 years later, these initiatives expanded to encompass the entire city.

Throughout this process, administrators engaged with local ward mayors and the presidents of residents' associations to leverage opportunities for residents to gather. Effective communication systems were diligently maintained by those involved. This period witnessed a transformation in health awareness among some of the city's residents.

(2) Dissemination Period (2011–2015)

Since 2011, the project has primarily been funded through the general budget provided by Tono City, subsidies from Iwate Prefecture, and participation fees collected from participants. Notably, city staff members involved in the initiative have expanded beyond the Health and Sanitation Department to include personnel from the Civic Center responsible for local community promotion. Furthermore, technical support was made available to ensure residents felt confident about operating ICT equipment.

By establishing an e-health activity system at each district center, health-conscious local communities and individuals have become more actively engaged in voluntary health promotion activities. A 2012 survey revealed that 48% of respondents reported losing or maintaining weight, and approximately 80% indicated that they had increased their daily step count. The number of activity centers also grew from 17 to 22, and the participant count rose from 150 to 471.

Unfortunately, despite an increase in the number of participants, the slower growth rate remained an issue. This was primarily because participants were predominantly health-conscious and elderly people who could readily join daytime activities. To enhance citizens' understanding of the project and sustain participant motivation, it was recognized as a challenge to provide evidence of health improvement and the project's relationship with medical expenses.

(3) Development Period (2016–2021)

In 2016, there were notable changes in the e-Health Class program. Exercise classes were integrated with health checkups, partly due to national policies prioritizing disease prevention and health maintenance. The model shifted from remote medical consultations to face-to-face health consultations by nurses and registered dietitians. Additionally, the introduction of the e-Health Point System aimed to incentivize behavior change among individuals less inclined toward exercise and health. Participants earned points for actions contributing to health promotion, such as participating in exercise classes, increasing daily step counts, improving health checkup results, and enhancing body composition. These points could be redeemed for shopping at local stores.

Moreover, in 2016, data storage for health and exercise data was outsourced due to high maintenance costs, and a commercialized health application was adopted. The e-Health Class extended its reach to some business sites to engage the working generation, although the number of activity bases was consolidated. Owing to these reforms, the number of participants significantly increased, reaching 1,477.

Regarding concerns about the relationship with medical expenses, the accumulation of health and exercise data enabled the calculation of the impact on healthcare costs, among other factors. Presently, this estimated effect serves as an indicator for achieving business goals.

During the declaration of a coronavirus disease 2019 emergency from April to May 2020, public facilities, including district centers, were temporarily closed, and individuals continued their activities independently. However, secondary health issues arose, such as muscle mass loss, deterioration of underlying diseases, and cognitive decline due to reduced outdoor activities and limited opportunities for physical exercise. As a response, activities in district centers resumed with safety measures in place. Over time, participants became increasingly conscious of their health, and exercise gradually became habitual.

3. Conclusion and Future Directions

In conclusion, several factors are crucial in hindering and promoting activities from the actors, institutions, and technologies perspectives.

First, it's imperative to establish robust human systems and networks. The introduction of ICT often introduces new stakeholders and complex human relations. To address this, it is essential to recognize that merely introducing ICT did not solve the problem; instead, it's necessary to utilize a close communication system among actors and make the most of existing networks.

Second, sustainability is key. The implementation of ICT can pose a substantial financial burden, often requiring subsidies. To ensure long-term success, verifying the system's effectiveness is crucial, paving the way for sustainable operation.

Third, incentives are essential to motivate participants. Implementing a point system can engage individuals who may initially be indifferent, significantly increasing the number of participants.

Fourthly, leveraging the full benefits of ICT, including data collection, accumulation, analysis, and visualization, is crucial. Personal health and exercise data accessibility through smartphones can maintain people's motivation. Converting participant data into panel data allows for calculating the effect of controlling medical costs and serves as evidence of business impact.

Lastly, technical support for operating ICT equipment is indispensable, particularly for the elderly. Appointing support personnel can significantly enhance the effectiveness of the initiative.

This study, which analyzes the development process of e-health activities in Tono City, provides insight into the critical factors for development. ICT in health promotion activities can raise awareness of voluntary health promotion among local residents and contribute to establishing health-conscious local communities.

Table2. Factors Hindering and Promoting e-Health Activities

	Hindering factors	Promoting factors
Actors	Increase in stakeholder involvement and complexity of human relationships	Focusing on building human system Close communication among stakeholders Coordination with external parties Utilization of key persons Utilization of existing human networks Reviewing the system
Institution	Apathetic layer Participant expense burden	Incentives Sustainable mechanisms
ICT	Financial burden for ICT infrastructure and equipment ICT equipment maintenance costs ICT equipment operation (especially for older adults)	Utilization of subsidies and beneficiary burdens Outsourcing and utilization of commercialized product Sustainable operation based on verification of effectiveness Technical support staff Publication of evidence

(1) Health consultations were initially conducted remotely via videophone; since 2018, they have been conducted face-to-face.

[References]

Onitsuka, Kenichiro (2015) *Restructuring of rural communities by utilizing SNS,* Agriculture and Forestry Statistics Publishing Inc.