

# Proposal for a Behavioral Transformative Digital Platform for Extending Healthy Life Expectancy



Global Research Institute

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the Extending Healthy

Life Expectancy Project Team

## **Chapter 1: Foreword**

The "Healthy Life Expectancy Extension Project" is one of the Keio Global Research Institute (KGRI) 2040 Independent Self-Respect Projects.

In order to realize healthy life expectancy extension in the super-aging society in 2040, we envision health services utilizing various research seeds and aim to design and propose a social system that links them in an interoperable manner.

### Purpose

- To examine what new health services are needed to extend healthy life expectancy in 2040
- To predict the current state of health in Japan and the challenges that lie ahead
- To focus particularly on behavioral change for health maintenance/promotion as an area of focus
- To propose new health services that contribute to solving health-related issues and systems to realize these services



# **Overview (Synopsis)**

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Chapter 5	Role of Universities
Chapter 6	Afterword

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## Chapter 2: State of Health in Japan and related Issues (Demographic Composition and Life Expectancy, Health Management)



- Not achieving expected results in disease prevention, finding rate increasing year by year
- Lifestyle (eating habits, lack of exercise) needs some improvement.

- Corporate health management is having an effect, but implementation is limited to only to some companies (30%), mainly large companies.
- Significant differences in implementation rates between large and small firms



Issues

## Chapter 2: Potential Impact on Medical Treatment and Long-term Care in 2040

	Medical systems		Long-term care systems	
Status	<ul> <li>The world's health care systems can be broadly categorized into the following three systems.</li> <li>1. State-run system (UK model)</li> <li>2. Social insurance system (Japan model)</li> <li>3. Private insurance system (American model)</li> <li>The Japanese health care system (2) is excellent in terms of accessibility to health care and low out-of-pocket expenses paid to medical institutions.</li> </ul>	•	The long-term care insurance system was launched in 2000 as a mechanism for society as a whole to support the care of the elderly. Anticipating an increase in the number of elderly people in the future, long-term care insurance premiums will triple (2,911 yen $\rightarrow$ 6,014 yen) from 2021 to 2023. Increased fee burdens are being considered The number of service users will increase approximately 3.3-fold.	<b>s</b> ;
Issues	<ul> <li>Soaring medical costs have become a social problem</li> <li>Health care spending is expected to increase by just under \$28 trillion between 2019 and 2040</li> </ul>	•	Increase in the number of long-term care leavers Accelerating shortage of required caregivers	

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# **Chapter 2: The Importance of Personal Health Awareness**



- Creation of health care services that can be supported on a personal level without human intervention is expected.
- Digital services are needed to support self-management capabilities, especially in the adolescent and mature years when such capabilities are required.

### Benefits of using digital technology

Low cost, fast processing speed, easy data linkage, immediate service response, and personalization make it easy to provide high quality health services.

It is desirable to change people's awareness to a mindset that they can "optimize their own health by utilizing digital health care," and prevent the advance of lifestyle-related diseases in particular through self-management.



# Chapter 2: Hierarchical Structure of Elements to Extend Healthy Life and Current Status of Utilization of Digital Technology



### Examples of Utilization of Digital Technology

### **Primary prevention**

Daily step counts, certificate of vaccination against COVID-19, measurement and analysis of sleep status, blood pressure measurement records and analysis, etc.

### Secondary and tertiary prevention

- PHR (Personal Health Record), which keeps track of data about one's medical care at hand
- Data banks (businesses that manage and operate personal data for individuals)
- **Treatment apps** (e.g., apps for treating hypertension do not use drugs, but send advice and messages to patients to encourage behavior change for blood pressure control)

Digital services are being used at the individual level for primary, secondary, and tertiary prevention, particularly mobile health apps and PHRs.



# Chapter 3: Analysis of Health Promotion Mechanisms through Digital Health Care Using Causal Methods

#### Data managemen

- Data acquisition technology and data quality management
- Integration of multiple types of data
- Data standardization for sharing PHR
- Balance of privacy protection for data standardization, laws and regulations

#### **Regional/sectoral management**

- Public EHRs linking medical information on a national scale
- Data linkage between insured medical institutions and private companies
- No defined management entities, management methods, etc. for safety and maintenance management

#### Intergenerational managemen

- Creation of mechanisms to expand dissemination and continue behavioral change
- Designing applications and guides with universal design in mind, taking into account diverse generations, people with disabilities, etc.

# Detailed Diagram of the Digital Health Care Dissemination Loop



### **Causal Loop Diagram**

A method of analyzing a situation in which numerous elements are intricately intertwined **from the perspective of cause and effect** in the relationships among the elements.

The green and yellow squares represent the elements of cause and effect (represented by variables).

A plus sign indicates a relationship between the two elements in the same direction, in which strengthening the cause strengthens the result, while a minus sign indicates the opposite relationship, in which strengthening the cause weakens the result.

R means Reinforcing loop (self-reinforcing type loop) and shows the behavior the increasing or decreasing behavior of the whole in a certain direction.

> Various efforts are being made to solve the problem, but the dissemination is still insufficient.

Digital use of health and medical information is rapidly being developed, but challenges remain in data management, regional/sectoral management, and intergenerational management.



# **Chapter 3: Relationship between Health Promotion and Digital Health Care**



### **Bottleneck for Digital Health Care to Improve Health**

In order for digital health care to lead to health, which is the goal of digital health care in the first place, focusing only on digitalization promotion efforts (digital health care dissemination loop) will not lead to health.

The current digital health care using wearable devices, etc., does not lead to behavioral change unless one's awareness is raised. This is a



It is important to improve health through the spread of digital services that promote behavioral change with effective interventions from the external environment (health promotion loop by digital health care).

Perhaps the essence of the problem is not the acquisition and management of data or linkage, but the lack of linkage to behavioral change.

Simply solving the challenges of the digital health dissemination loop is not enough to manifest the value of digital health care.



# Chapter 4: Proposal for Environmental Change Type Digital Service Platform for Behavioral Change

It is difficult to maintain behavioral change only by working on the individual, and there is a limit. A system that directly intervenes in behavior from the surrounding environment (=environmental change type) supports behavioral change that does not rely solely on the will of the individual.



The ultimate vision of an environmentally transformative digital service platform for behavioral change is to enable the entire city to intervene in behavior to achieve the users' objectives.



### Reference

# Relationship between the 5 Stages of the Trans-theoretical Model and the Behavioral Change Process



#### 10. Reinforcement Management 9. Helping Relationships

Varying the accompanying content in controlling or maintaining the problem behavior Trusting, accepting, and using the assistance of others who care the person in their attempts to change problem behavior

#### 8. Stimulus Control

Manipulating the environment to generate behavior and creating trigger cues

#### 1. Consciousness-raising

Seeking out new information and efforts to gain understanding and feedback on problem behaviors

#### 2. Emotional Arousal/Dramatic Relief

Informational elements related to making change, often intense emotional experiences related to problem behavior

#### 3. Self-revaluation

Reassessment of the individual's estimate of the emotional and cognitive value of the problem behavior

#### 4. Environmental Revaluation

The individual's thoughts and assessment of how the problem behavior is affecting his/her physical and social environment

#### 5. Social Liberation

The individual's building, exploring the possibility of using, and acceptance of alternative behaviors and how the promotion of lifestyles free of problematic behaviors is progressing in society **6. Self-liberation** 

Verbal characteristics to transform problematic behavior

#### 7. Counterconditioning

Alternative behaviour for problem behavior

It is necessary to consider the behavioral change stage of the subject and provide the right intervention method at the right time.



# Chapter 4: Examples of Environmental Change Type Digital Services for Behavioral Change

Target

Examples of Intervention (Images)

Intervention services are expected to be provided in all areas of life.



If the market develops, it could lead to the creation of a new industry of intervention services.



Behavioral Change Process Types

# Chapter 4: Customer Value Chain of Environmental Change Type Digital Services for Behavioral Change

The platform service providers in some way, analyze user information such as health status and eating behavior, and issue intervention instructions to intervention service providers, so that users can receive appropriate intervention services.



The user pays an **intervention service fee** to the intervention service provider, and the intervention service provider pays a **platform usage fee** to the platform service provider.

Platform service providers acquire and analyze user information and match users to intervention services.



# Chapter 4: Platform System to Enable Environmental Change Type Digital Services for Behavioral Change



### Health Status Monitoring System

In order to provide appropriate intervention services at the right time, the health status and lifestyle behavior data of users are acquired, taking into account where they live, their preferences, health status, and stage of behavioral change.

#### **Analysis System**

The acquired data is integrated and analyzed to determine suitable intervention services. It is envisioned that the system will be able to learn patterns of success or failure of interventions that are appropriate for the type of target user or specific group and make more appropriate decisions.

### **Multiple Interventions System**

Provides intervention services. In addition, it is necessary to have several different intervention services in order to provide new services in the event that a client gets bored and discontinues use.

### **User Interface System**

Like a cell phone, this system informs the user of changes in behavior and health status after the intervention and provides feedback.

### Management & Operation System

Overall management and operation using human resources.

## Existing systems can be combined to make the platform work.



# Chapter 4: Proposal for a Mechanism to Receive Intervention Services without Informing Service Providers of Personal Information



While this model may be difficult to accept for service providers who want to use user information for marketing and business strategy development, it may be beneficial for sole proprietors, single stores, and start-ups that are unable to collect, manage, and analyze user information on their own.

# Chapter 4: Governance of Environmental Change Type Digital Services for Behavioral Change

Environmentally transformative digital service platforms for behavioral change require proper governance because they enable control of people's behavior.

Wh	en a municipality or government is the main entity	W	hen a single cor ent
•	Only residents of the municipality concerned are eligible for services Difficult to provide services across	•	Concerns about to management of uplatform service phealth/lifestyle be
	Problems arise in terms of dissemination		Risk that platform
	It is easy to obtain a sense of security in managing personal information and understanding of		providers who pa
	the use of personal information. Concerns that the system will be perceived as a mechanism for the	•	Concerns that us purchase interver not want
	government to control residents, and that this may cause opposition.		Governance that kind of restraining needed

npany is the mair

- he reliability of the ser data obtained by providers and havior monitoring
- service providers will vention service v more for their
- ers will be induced to ntion services they do
- functions as some mechanism is

Elements such as what governance mechanisms are needed, including laws and regulations, rule formation in the industry, auditing and citizen dialogue need to be considered.



# **Chapter 4: Impact on Society of Implementation**

### **Positive Impact**

- Expected to increase the number of citizens who can sustain healthy behaviors without strain and maintain good health
- A new industrial field of "intervention services for behavioral change" may be created
- Since there are currently only a few services that physically intervene in behavior using digital technology, it is expected that an idea can be created for a completely new service field

### **Negative Impact**

- Ethical aspects need to be considered
- Users make their own decisions to use intervention services, but if interventions are performed without the user's knowledge, is this an independent and autonomous choice and decision?
- Even if all intervention histories are visualized and a system is created to enable the selection of interventions, is autonomy really ensured?

It is important to imagine real-life examples of intervention services being promoted on digital platforms and to discuss in advance possible future ethical issues.



# **Chapter 5: Role of Universities**

We believe that there exists an important role unique to universities as research institutions in making proposals in industrial areas that have not traditionally been highlighted as the role of universities.





# Research institutions with multiple disciplines



- Unanticipated collateral effects and secondary effects of new social systems can be identified in advance
- (1) It is possible to predict the occurrence of unexpected phenomena such as butterfly effects that may spread in unintended directions in the future due to interventions, and to grasp information on signs of secondary ripple effects, and to evaluate unexpected chain reactions in advance
- (2) When viewed as a whole system, the ability to identify in advance the signs that an intervention structure is on the verge of becoming a black box or malfunctioning as a device is a strength that cannot be surpassed by any other sector

Verifying comprehensive health as a comprehensive environment that includes the guarantee of excellence in knowledge and scientific processes, as well as relationships with the surroundings, and fulfilling the unique responsibilities unique to a university.



## **Explanation of Terminology**

### **Health Care**

In this working paper, however, we distinguish between those covered by the existing medical insurance and long-term care insurance systems and various other measures and devices related to health maintenance and position the latter as "health care."

### **Digital Health Care**

Digital health care refers to tools and services that utilize information communication technologies to monitor and manage lifestyle-habits that affect health by preventing, diagnosing, treating, monitoring, and managing health-related problems. <sup>\*1</sup>

### **Digital Platform**

We define a digital platform as "a platform that uses information and communication technologies and data to provide an online service "venue" for third parties, forming a multifaceted market where multiple different user groups exist, and which is characterized by the so-called indirect network effect." \*2

\*1European Commission, eHealth: Digital health and care, Overview https://health.ec.europa.eu/ehealth-digital-health-and-care/overview en

\*2 Antimonopoly Law Approach on Abuse of Superior Bargaining Position in Transactions between Digital Platform Operators and Consumers Who Provide Personal Information, etc., December 17, 2019, Japan Fair Trade Commission, Revised: April 1, 2022

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