

Well-being and Technology

(Whitepaper)



NTT DATA Corporation

Toyosu Center Building, 3-3, Toyosu 3-chome, Koto-ku, Tokyo
Phone: +81-3-5546-8202
<https://www.nttdata.com/global/en/>

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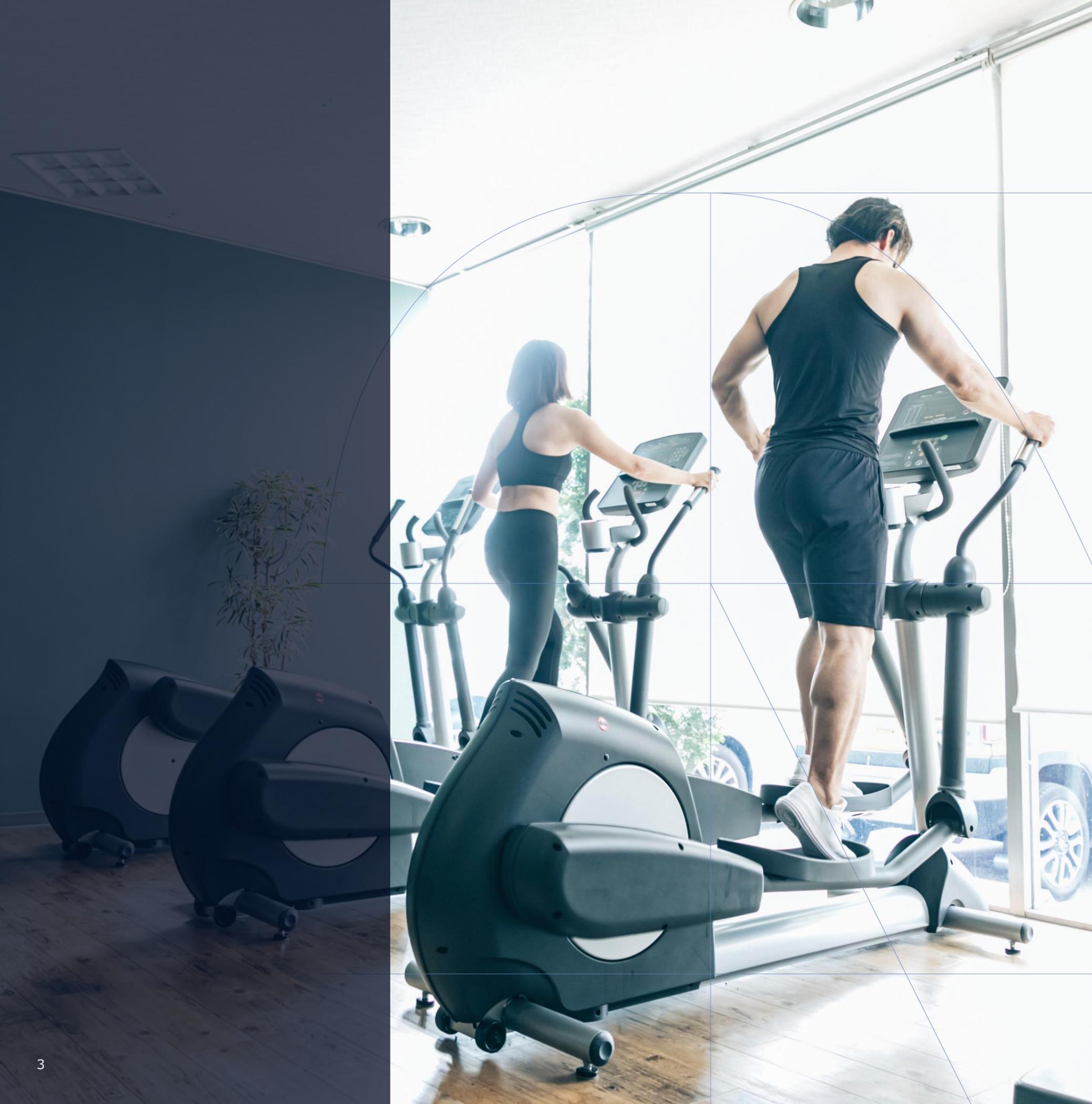
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CHAPTER.1

Introduction

"Health is a state of complete physical, mental and social **well-being** and not merely the absence of disease or infirmity."

(From:<https://www.who.int/about/governance/constitution>)

Well-being was first contained in the charter of WHO at its foundation in 1946; Well-being means a state of satisfaction in regard to physical, mental, and social conditions.

This document introduces initiatives about well-being in Japan and abroad, followed by the reason why well-being should be relevant to us. Then, we will show the processing model to support individual well-being that NTT Data designs and introduce technical frameworks for the purpose and client analyzing AI of NTT Data.



CHAPTER.2

Trends related to well-being

2.1 National trends

Well-being in Sustainable Development Goals (SDGs)

Goal 3 of SDGs, which was unanimously adopted at the United Nations Summit in September 2016, says, "Ensure healthy lives and promote well-being for all at all ages." Well-being is greatly relevant to achieving SDGs goals.

Well-being–centric society

The Davos meeting (the WEF annual meeting) in 2021 featured "The Great Reset". This idea proposes resetting and restructuring all the systems including social economies; the founder of WEF, Klaus Schwab, said that we should reconsider the economy by putting well-being at the center and he also proposed reconstruction of the economy in light of well-being.

Advent of Well-being economy

In 2018, Wellbeing Economy Alliance (WEAll) was established with governments of nations, policymakers, scholars, activists, corporations, and NGOs. It introduced a new concept for economy: Well-being Economy. WEAll proposes some indices including health, living standards, labor compensation, civilians joining politics and quality of natural environment and articulated their vision-- that they will bring common happiness to human beings and the Earth by reconstructing the economy by 2040. Also, Wellbeing Economy Governments (WEgo), which promotes the well-being economy, was established; Scotland, New Zealand, Iceland, Wales, and Finland have joined this government

and they make policies with well-being at the center.

Announcement of Well-being Budget in New Zealand

The prime minister of New Zealand, which is one of the leading countries in regard to well-being, Jacinda Kate Laurell Ardern, said at the Davos meeting in January 2019, "We need to address the societal well-being of our nation, not just the economic well-being,". He then introduced a Well-being Budget in May. This was an announcement that he would spend the budget of the nation on the well-being of its citizens.

2.2 Domestic Trends

One of the leading initiatives in Japan: GAH of Arakawa Ward in Tokyo

In Japan, autonomies are actively dealing with well-being issues, one of which activities is GAH (Gross Arakawa Happiness) of Arakawa Ward, Tokyo, introduced in 2005, followed by its own think tank establishment (Research Institute for Local government by Arakawa City: RILAC) in 2009. They research and develop indicators about happiness of its population and published their own happiness indicator consisting of 6 areas and 46 items in 2012.

Trend in the Cabinet

In 2011, the Cabinet Office held a "Study team about happiness", which resulted in "Study report about happiness: A draft of happiness indicator." In 2019, the Cabinet shared its goal, "They multidirectionally understand the structure of the society in Japan from the viewpoint of well-being of individuals to capitalize on it for policy maneuver,". It also started research about well-being and quality of life by conducting a

survey on overall well-being and 11 life satisfaction fields. At the same time, the traditional objective indicator, which was deemed relevant to well-being of each field, was set as Well-being dashboard (which indicates well-being and quality of life).

The “Large-boned policy” published in June 2021 reads that they “set KPI for well-being related to every basic plan of the government” along with the policy of economic and fiscal management.

Political blueprint of digital rural city and well-being indicator use

The first meeting to realize a digital rural city in November 2021, newly introduced “well-being” as its core concept, encouraging and prioritizing well-being and sustainability. They also proposed that each region should check well-being indicators periodically to improve it in accordance with KPI.

2.3 Rapid growth of well-being market

Research by the Global Wellbeing Initiative (GWI), which Gallup and Wellbeing for Planet Earth (WPE) co-founded, shows the market for well-being in 2021 was worth 4.4 trillion dollars, with expectation to increase by 10 percent per year, expectedly leading to 7 trillion dollars in 2025 ^[1].

Nfluence Partners and Transformative Technology jointly developed three categories for the well-being technology market: Body & Physical Wellness, Mental & Emotional Wellness and Workplace & Life Wellness.

[1] Global Wellness Institute, Research Report-The Global Wellness Economy: Looking Beyond Covid, <https://globalwellnessinstitute.org/press-room/press-releases/2021-gwi-research-report/>





CHAPTER.3

Why well-being is relevant to us

Well-being is increasingly relevant given the trend of the government, the standpoint of the market and management strategies, and intra-organization management.

3.1 Government's point of view

Well-being is included in SDGs, which a national society should achieve

The Goal 3 of SDGs includes “Good health and Well-being”; thus, well-being is now a key concept which the government and companies must deal with.

Well-being is included in the Society 5.0 concept

The Society 5.0 concept clearly envisions a society where each individual achieves well-being and sustainable toughness ensures safety and security of the people against uncertainty.

Well-being as countermeasure against decrease of workforce

Low birthrate and longevity in the society in Japan will entail lack of workforce, which is an urgent problem for us. Working and being a consumer for a long lifetime requires physical and mental health, which is where the well-being concept comes in. Also, as one of the measures to keep workforce, it will be necessary to create an environment where women can come back satisfied with the work after marriage.

3.2 Standpoint of the market and management strategies

Environmental, Social and Governance (ESG) investment and well-being

In the “Social” category of ESG indicators, to which corporate investors pay attention to when they make decisions, shows that we should ensure diversity and work-and-life balance. We need to think twice about whether we are successfully providing a work environment for the well-being of employees.

Well-being-related market worth 400 trillion yen

The market for well-being is estimated, by Global Well-being Institute, to be worth almost 400 trillion yen and is expected to expand further. This market is relatively young and immature, so investors expect it to provide high returns in the future. In the U.S., the technology for well-being used to be something for a B-to-C solution, but now the demand in the B-to-B market has increased for the needs of corporate management considering well-being.

Innovation through evolution of AI technologies

AI technologies have been well developed, including those of sensors to capture a physical and mental condition of human beings and something to process natural languages fluently, and this trend brought about innovation related to personal data usage. Here, now we can find various services and products to support well-being of individuals.



3.3 Standpoint of intra-organization management

Well-being of employees must be achieved for companies to obtain and retain talents and increase productivity. Now that a way of working is re-defined as “new normal” and it is compulsory to disclose information about human capital in U.S., the importance on well-being is highly relevant to companies, leading to promoting initiatives.

Obtain and retain talents

A paper by David Wyld, at Southeastern Louisiana University [2], shows improvement of well-being contributes to turnover rate decreasing. Wyld et al. researched the correlation between well-being of employees and turnover rate for three years and found that the longer an employee works for the company, the more correlated higher levels of well-being and the lower turnover rate are.

Increasing productivity

The paper by Ed Diener, who is an authority of well-being research in the U.S. at University of Illinois, et al. in 2005 shows those who subjectively feel their well-being is of high levels are three times as creative, 31% more productive and sell 37% more than those who don't [3].

Response to a New Normal

The aftermath of Covid-19 forces companies to adapt themselves to a new normal. The fact-finding survey about teleworking by Recruit Management Solutions Co., Ltd. in 2020, which questionnaire had 2,658 respondents, shows more people feel “lonely or isolated,” “not appreciated fairly or such a fear,” “positive feelings like appreciation, motivation for contribution and pride” and so on [4]. A measure or tool to monitor and improve mental and emotional conditions of employees will be needed.

Commitment of human capital information

In August 2020, SEC (U.S. Securities and Exchange Commission) made it compulsory for listed companies in the U.S. to disclose human capital information. The standard, ISO30414, stipulates that well-being is related to a lot of items to be disclosed; for example, in “Organizational health, safety and well-being”, the term, “well-being”, is directly mentioned in the subject, and the item about “Organizational culture” shows indicators like Engagement, Satisfaction of employees, Commitment of Employees and Retention Rate, all of which are relevant to well-being of employees.

Companies without data about such psychological states must obtain quantitative data by using a metric tool like a questionnaire for employees. Thus, companies will have to obtain data about well-being and improve them.

[2] Wyld, DAVID C. "Research briefs: Do happier employees really stay longer." *Academy of Management Perspectives* 28.1 (2014): 1-3.

[3] Lyubomirsky, Sonja, Laura King, and Ed Diener. "The benefits of frequent positive affect: Does happiness lead to success?." *Psychological bulletin* 131.6 (2005): 803.

[4] Recruit Management Solutions, Telework Emergency Survey <https://www.recruit-ms.co.jp/research/inquiry/0000000852/>



CHAPTER.4

Approach to enhance well-being

So far, we have seen why well-being is relevant to us from the viewpoints of domestic and international trends. Now, how should we

support and enhance the well-being of people? Let's see the process here.

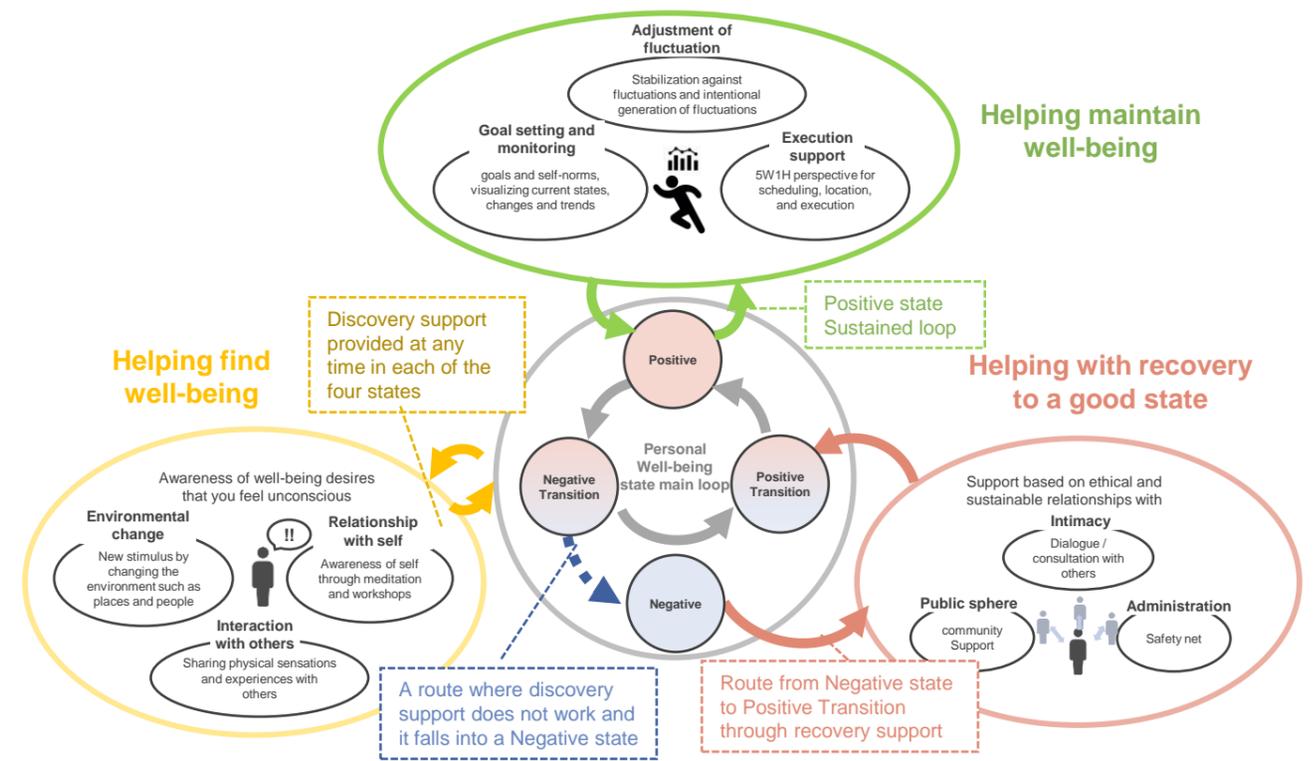


Fig.1 Supporting process model for individual well-being

Figure 1 shows an abstract model of a process to support well-being; this model is an individual well-being support framework developed by NTT DATA in cooperation with Junji Watanabe of NTT Communication Science Laboratories. It intended for the purpose we found important through the

research of NTT Data and the trends related to well-being among people. We expect this model to be used as a foundation for discussion about enhancing well-being and sharing values and thoughts on well-being.

Let us begin by describing the components. This model divides well-being of an individual into four states: Positive, Negative, Negative Transition and Positive Transition as sketched in the center of the figure. Being Positive means that he/she feels good, being Negative indicates he/she feels bad, Negative Transition is on the way from being Negative to Positive, and Positive Transition from being Positive to Negative. An individual's "well-being" state undergoes these 4 states over time.

We propose three ways to support well-being: help find well-being, maintain well-being, and recovery to a good state. Helping find well-being is supporting people to return to being Positive by having them look back to their past or giving them a new experience (especially when they are on Negative Transition). Helping maintain well-being is helping people keep their positive state, and helping with recovery is supporting those who are in Negative state to come back to be Positive with the assistance of other people, communities or governments or by changing their environment.

4.1 Helping find well-being

This assistance is needed when people are on Negative Transition, from being Positive to Negative. This is assistance for people to be aware of what their happiness triggers are and what their state is. We have conscious part and unconscious part of the state of ourselves in daily life and work. The unconscious parts are something like fatigue we don't feel but have, discomfort in our life or work, desires of which we don't have a way of description, etc. the assistance to help find well-being, is to help people understand what they feel and what happiness and well-being means to them

For those who need this assistance, for example, we can stimulate them by changing environments around them like workplace or other people, make them aware of themselves by encouraging meditation or having some workshop, provide an opportunity to let them acquire another value through experience with others, and so on.

4.2 Helping maintain well-being

This is to assist people who are in Positive state to keep it. One example for this would be making them set a positive goal for themselves. Such as "Eating healthy" and break it down to more specific behaviors like "Eating vegetable three times every day".

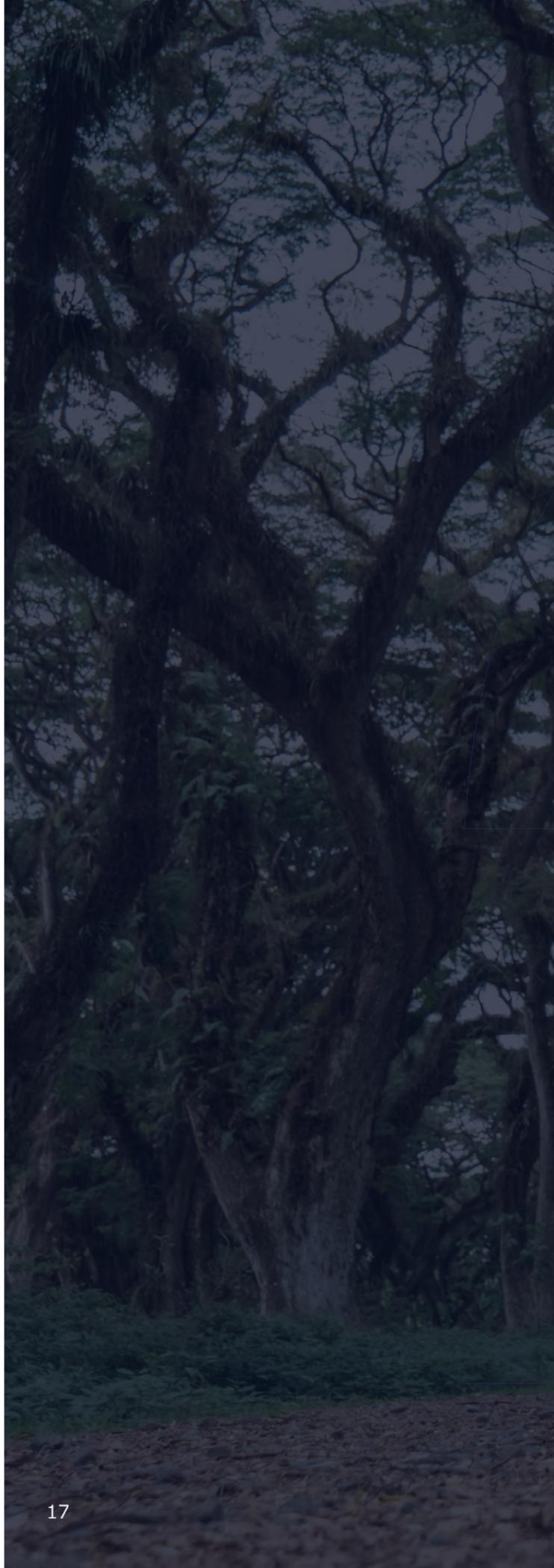
For those who need this assistance, for example, we can keep their record, visualize the progress toward the goal set and motivate them by making a specific plan including when, where and what to do.

In order to maintain the state, it is also necessary to intentionally make changes to some extent. Human beings are not good at keeping one thing constantly every day; thus, we need some changes like having some varieties of meals. When people are deviated from a good state, we must take measures to make them aware of it and come back.

4.3 Helping with recovery to a good state

This assistance is for those have fallen in a negative state; this "negative" state means a





state where they cannot pull themselves together, where they need to be resilient through assistance based on continuous and ethical relationships with others. When this assistance works well and they find a way out of their crisis like overcoming some difficulty or changing environments, they shift to Positive Transition.

Helping with recovery requires an ethical and continuous relationship with someone else; although there are some definitions about what "ethical relationship" is, let's define it as a relationship based on respect to characters of each other, sharing emotion and empathy here.

We can provide this assistance for those in need through intimate sphere, public sphere, and administrative measure.

Intimate sphere is a place where an intimate and ethical relationship is established; although a family is often one of such places, intimate sphere can be a friendship without blood tie. Also, a family is not always intimate sphere, given the definition.

Public sphere is, for example, local communities, online communities, or a group at a workplace. Administrative assistance is a measure called "safety net."

Thus, helping with recovery to a good state requires someone else in intimate sphere or public sphere, or an administrative measure. In this case, we need a system to get aware of a negative state of someone to intervene. It may be by an eye of someone, information sharing, communications, conducting a survey to obtain quantitative data or usage of the polling system. We need such a system to monitor their state periodically to be aware of a problem immediately.



CHAPTER.5

Technology to support well-being

Now let's proceed to a framework to help people keep and find well-being technically. This framework uses three technologies to enhance well-being of living people and continuously motivate them to change behaviors (Nurturing): User analyzing technology, Measure optimization technology, and effective measurement.

I will briefly describe how these technologies work in terms of ' Helping maintain well-being '. Since "Helping maintain well-being " is support for maintaining a good state of individuals continuously, it is necessary to first understand what kind of state the user is in. Here, measurement using "(1) user analyzing technology" is necessary. do.

Next, after taking into account the user's status, appropriate improvement measures are presented using "(2) Measure optimization technology" in line with the goals and self-regulations set by the user. For example, if the user is motivated by his or her own growth, we present measures that will lead to that growth. If you have characteristics that respond well to such incentives, we will propose such measures.

Finally, using "(3) Effect measurement", we measure the results of implementing measures and feed them back to the measured values of the status and the strategy optimization logic.

The details of each technology are described below.

1: User analyzing technology

When we want to enhance well-being of someone, we need to understand him/her first, for example, how old he/she is, what character he/she has, how the latest mood is, how the eating habit is, and so on. We divide the standpoint to understand a person into three elements: Attribution, Characteristics and State.

Attribution of users is equivalent to that of demographic, including gender, age, occupation, resident area, single/married and so on. Characteristics of users are psychological traits which remain relatively the same regardless of time, characters, or values (about food, clothing, housing, and working). A state of users is a state which is subject to time passing, like long- and short-term hobbies and diversions, behavioral state (indoors/outdoors) and cognitive satisfaction about their life and emotional state, which are included in the indicators of subjective well-being.

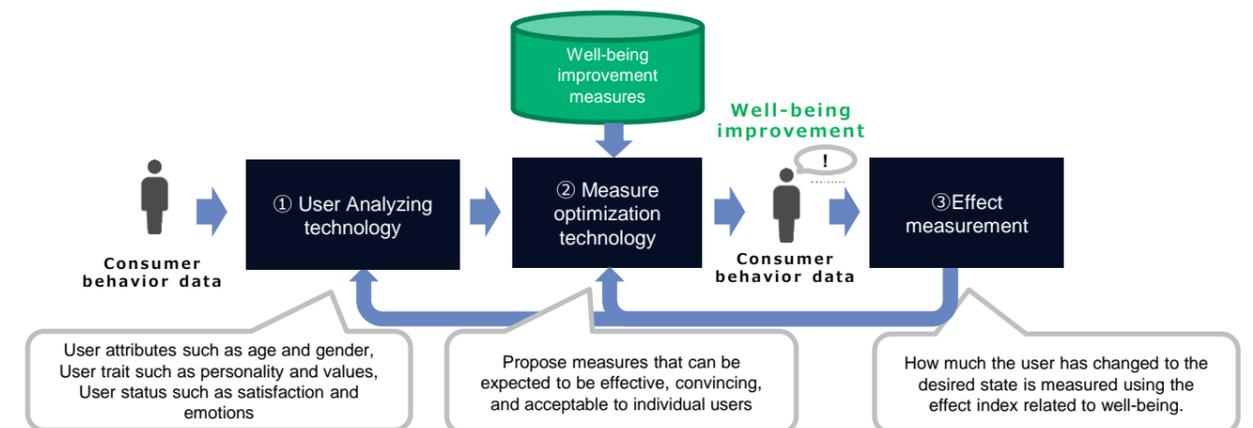


Fig.2 Framework for support by technology

A user analyzing technologies is an automated technology to obtain data relevant to such attribution, characteristics, and a state by referring to behavioral data like posting on SNS, GPS data, footprints of web pages and usage history of services.

2: Measure optimization technology

A measure optimization technology refers to a technology which offers an optimal measure for enhancing well-being based on the understanding through user analyzing technologies.

It depends on what conduces to well-being; we should review the effectiveness of a measure to optimize it by both objective validity (whether it is applicable to somebody else) and subjective validity (whether the user feels satisfied with and accepts the measure offered).

3: Effective measurement

An effective measurement refers to a technology to review the effectiveness how the state of the user has changed since a measure for changes was implemented. Here, we confirm the effectiveness by the subjective indicator, which is a general index of well-being, and its sub-indicator, that of component factors of well-being.

5.1 Customer Analyzing AI Technology of NTT DATA

So far, we have seen a technological framework for well-being, including user analyzing technologies, measure optimization technologies and effective measure technologies. Now, let's see the customer analyzing AI Technology that NTT DATA is dealing with.

The customer analyzing AI Technology is an AI technology to deduce characters, values, preferences and living practices based on non-structural personal data like SNS posting and GPS data. Let's see how this technology can be used for cases.

First, we can expect marketing measures to be improved by understanding customers with high resolution and long period. Traditionally, we had to divide customers into some segmentations with questionnaires, analyze factors based on data about their purchase or cluster them to understand them; however, with the customer analyzing AI technology, now we can obtain data about characters, values, preferences and living practices of each individual in real time and their change over time allows us to foresee what comes next. This enables us to offer life-care services suitable for their lifestyle, character, and preference, leading to their satisfaction and enhancement of LTV (Life Time Value).



For such a service, we can expect to offer a fitness program and healthy foods for the lifestyle and fitness habit of a customer and visualize the effectiveness for them to feel well-being is subjectively achieved, leading to their satisfaction. Also, for sales practices, we often see a gap between an experienced operator who can deeply understand customers and a fresh one at a call center where staff deal with enrollment, cancellation, and sales; with support by the customer analyzing AI technology, their engagement will be enhanced, leading to more sales and less cancellations. In the educational field, the technology allows us to develop a learning program for each student, considering their mental characteristics and state. We also can be aware of someone being mentally imbalanced at the early stage by looking into talks in a coaching session or their diary.

5.2 Standpoint of AI and ethics

While technologies are expected to provide services of great value and new experiences for users, we need to think about usage of personal data and of AI technologies in services targeted to an individual, considering ethics related to AI.

As ethical guidelines for AI usage, many documents have been published domestically and internationally since around 2016; in recent years, Nakagawa^[5] showed relations among some concepts including accountability, understandability, and transparency; out of which, accountability, which consists of issues related to people, organizations, and technologies, is difficult for general users of AI systems to understand. It's said, thus, a concept, "trust", came to the surface.

Ethics Guidelines for Trustworthy AI (Trustworthy AI, for short) developed by The European Commission's High Level Expert Group on Artificial Intelligence in 2019 stipulates that something trustworthy must be lawful, ethical, and robust and "Trustworthy AI" must:

- Be under surveillance by human beings, and human beings should be independent
- Be technologically robust and secure
- Have privacy protection and data under its control
- Be transparent
- Be diversified, non-preferential and fair
- Contribute to environments and social well-being
- Be accountable

The technologies to support well-being should be discussed also with reference to these Trustworthy AI requirements. For example, we should consider the possibilities like whether recommendations by AI to change may lead to loss of our independence, how we should think about robustness of deduction about subjective mind, how we protect privacy of personal data, how we can get rid of biases against gender/race or when conducting questionnaires about characters/values, how we should think about relation between personal well-being and social well-being, how we can compensate for accidents or damage caused by intervening in a life, and more.

NTT DATA continues to discuss AI ethics like these, develop technologies to contribute to well-being of people, and aim for realizing a sustainable society.

[5]中川裕志. "AI 倫理指針の動向とパーソナル AI エージェント." 情報通信政策研究 3.2 (2020): 1-24.
<https://cir.nii.ac.jp/crid/1390002184889846784>