

Realization of Sustainable Informatics through Continuous Utilization of the Information Environment

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Abstract— This study aims to explore the importance of efforts in the information sector of the SDGs from multiple perspectives and to realize a sustainable information environment. The information environment consists of three elements: "environment," "tools," and "culture," and each must be considered for sustainability. This study also highlights examples of sustainable information environments and emphasizes the importance of SDGs informatics. The goal of this study is to propose ways to achieve a sustainable information environment while enhancing social diversity through SDGs informatics and maintaining the existing information environment.

Index Terms— SDGs Informatics, Sustainable Informatics, Sustainability, Information Environment

Introduction

In recent years, institutions, local governments, and companies worldwide have been working to resolve issues related to the 17 goals to realize the Sustainable Development Goals (SDGs). The SDGs aim to realize a society in which “no one is left behind” and to maintain the environment of the earth and society in the future. The SDGs in the “information sector” are attracting particular attention. It is expected that the spread of Information and Communication Technology (ICT) will play a role in shaping the foundations of industry and other sectors and would bring about technological innovation. Around the world, IT is being used to build infrastructure and develop new technologies to realize sustainable industries. Therefore, this paper aims to realize a sustainable information environment based on the goals of SDG 17. It also defines “information environment” and explains the today's significance of SDGs Informatics, which enables us to continue to use changing environments and technologies under any circumstances.

What Is Sdgs Informatics?

A. SDGs and Informatics

Today, we live in an environment with overflowing information technology, using tools such as social networking and mobile phones to form a culture of digital and analog communication. SDGs Informatics is the study of informatics for realizing a sustainable information environment, and is the study of designing the theories and methods that will serve as the foundation for sustaining the information environment. An important point of view in

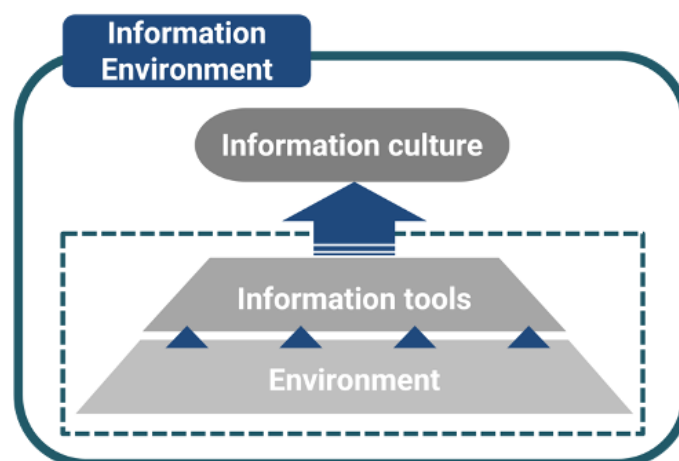


Fig.1 Composition of the information environment

advocating SDGs Informatics is the “information environment.”

The “information environment” in this study consists of three elements: “environment,” “information tools,” and “information culture.” The “environment” refers to the environment in which information is accessed (collected and transmitted) and processed. The “environment” is the foundation of the information infrastructure, and on top of it are the “information tools,” which are platforms for utilizing the information environment and tools for accessing the information environment. “Information tools” practically work as platforms. The combination of these two elements gives birth to “information culture.” “Information culture” is also created when people use “information tools” to achieve their purposes, and human actions and experiences are essential elements for it. “Information culture” also includes by-product created by the actions and experiences (mainly humans’) associated with the use of the environment.

These three levels of elements are collectively referred to as the “information environment” in this study. “Information environment” cannot be established if even one of these elements is missing.

B. What is Information Environment?

As a concrete example of an information environment, we point to the Internet as a means of communication. To achieve the goal of “communicating with people (others),” they access the environment called “the Internet.” As a mean of accessing the Internet, they use information tools such as mobile phones and smartphones. In addition, a culture of digital communication, such as e-mail and social networking services (SNS), has emerged to achieve the ultimate goal. By breaking down the information environment into “environment,” “tools,” and “culture,” it is possible to visualize the elements that are currently ‘sustainable’ and ‘unsustainable.’ Furthermore, the sustainability of ‘information’ is becoming more difficult to maintain due to rapid changes in devices and significant platform updates. The remarkable changes in the information environment have created a divide between those who have capability to respond to the updates or those who belong to an environment in which they can naturally respond, and the rest of the population. This state of affairs is a far cry from a ‘no one left behind’ society.

The authors focus on this issue and aim to realize a “sustainable information environment.” The realization of a sustainable information environment means that what is possible within the existing information environment can stay also possible continuously in any changing environment or technology. The goal is to continue to use the surrounding "Environment," "Information Tools," and "Information Culture," and to build an environment where people can continuously inherit the technologies and culture of the past and present, and they can use them with a different approach from convenience only. In the realization of a sustainable information environment, the gap in the information environment will be bridged, and support will be provided for the discovery of technologies that can respond to changes in circumstances according to times and trends.

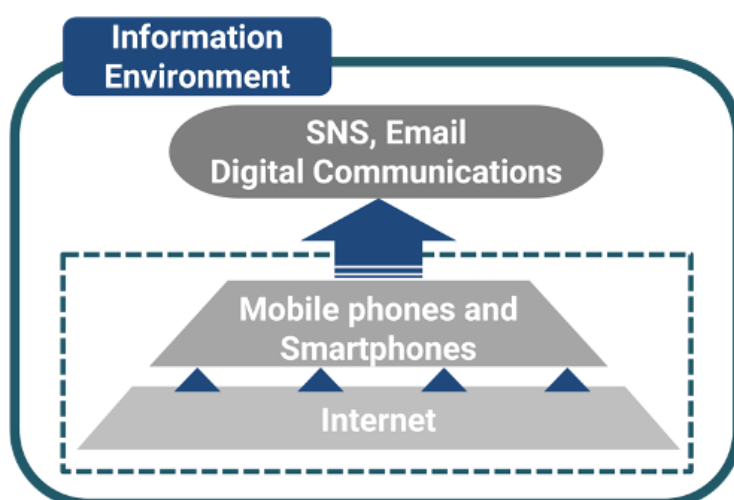


Fig.2 Example of information environment: Case of Internet

Related Work

This chapter will highlight sustainable systems and research case studies and discuss how these efforts are impacting us. We will clarify elements that lead to sustainability and SDGs Informatics upon each case and make the identification serve as a preliminary survey for this study.

C. “PotatoP,” a Computer with Less-Power Consumption

“PotatoP” is a sustainable laptop computer that is estimated to run for two years on a single charge. This computer was intentionally developed with lowered computer specifications to extend battery life, and its less-power consumption allows it to last longer on a single charge. The device uses a lithium-ion polymer battery, keyboard, solar panel, SD card, and monochrome display, and runs a proprietary operating system programmed using “uLisp.” It is appropriate to say that the computer is sustainable and user-stress-reducing, depending on the intended purposes of the users.

Text-based tasks such as programming or writing documents do not require a high-performance, power-hungry computer like a MacBook. For example, if one wants to concentrate on writing for an extended period of time, away from the city, he or she can utilize solar power in parallel while keeping typing until the battery runs out. This is a sustainable computer because it can be used anywhere under the condition with sufficient light in the vicinity to extend its operating time.

D. Portable OS: Live CD/ Live DVD

An OS is usually installed on a computer, but it is also possible to boot an OS on a storage medium such as a CD or DVD. When a Live CD is booted, the OS owner's desktop is displayed, allowing him/ her to use the OS in the same personal OS environment that he/she normally uses.

In short, with a single Live CD, the same environment can be facilitated on any desktop PC, such as PCs at the office, on a business trip or traveling abroad destinations, instead of just on a fixed desktop PC. This is a device designed for a certain convenience, in response to the users' need to use the same screen and functions wherever they are. Therefore, it is possible to say that Live CD/DVD is a highly sustainable medium that can be utilized in different environments and situations.

Case Studies

In each case study, applications and systems were designed based on the concept of a sustainable information environment. In addition, this chapter describes each initiative and refers to sustainability, with the three elements of the information environment to be consisted of SDGs Informatics.

E. Creating a Sustainable Knowledge Community Using Bluetooth Low Energy

In this attempt to solve the issue of SDG Goal 16 "Peace and Justice for All," the authors designed a sustainable communication system using Bluetooth Low Energy (hereafter, BLE). The authors focused on 16-10 of the 11 targets that comprise Goal 16 and introduced BLE to create an environment in which information can be handled basically freely without being restricted by third parties. Generally, digital communication has been conducted via the

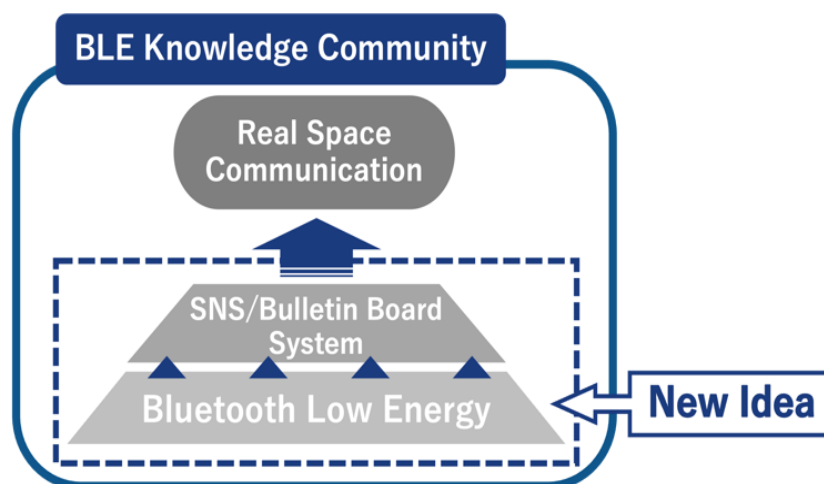


Fig.3 Configuration for "Information Environment" of Knowledge Community by Bluetooth Low Energy

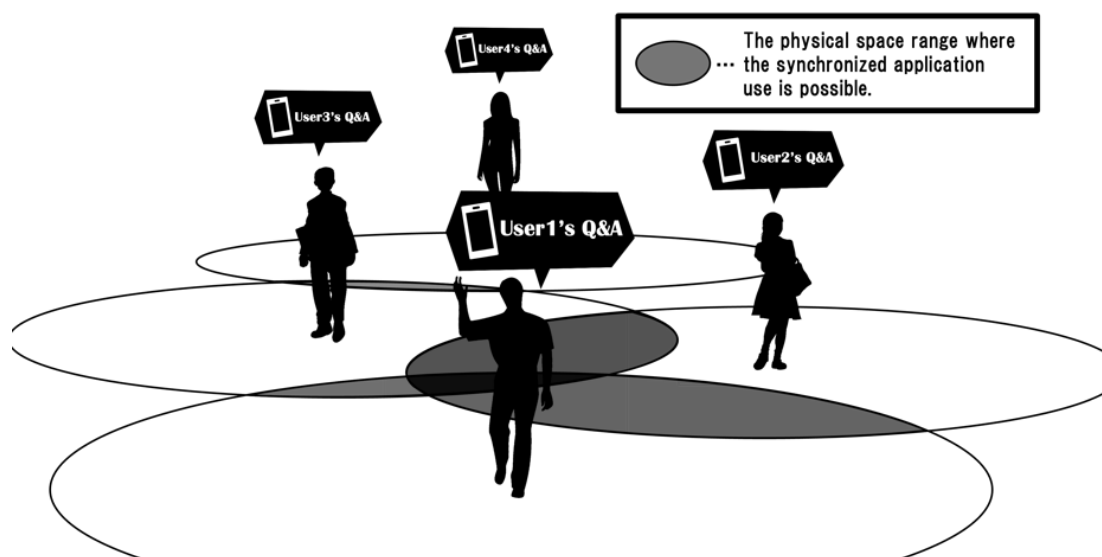


Fig.4 Physical Space Image for Application Use

Internet and using specific platforms. However, there are cases where the freedom that should be there is lost depending on the company or organization providing the service. An environment in which people communicate while someone other than them has the decision-making power, is not sustainable. Under these circumstances, we devised a short-distance communication system using wireless communication as a means for users to communicate without being controlled by others. In addition to communicating within the range of wireless communication connectivity without the Internet, this system is also characterized as 'knowledge sharing' among users. This platform is similar to an electronic bulletin board. Users can chat in Q&A sessions on their assigned personal bulletin boards and feel connected to others by sharing knowledge. It is not a social networking service for private conversations, but a spatial community that can be formed with the knowledge possessed by users by making it public. Therefore, the novelty of this research is the idea of a certain limited community in which each user is given equal rights to disseminate information within the range of radio transmission and reception.

In addition, the knowledge community consists of an information environment as shown in Figure 3. Here, "Environment" is BLE, which is the foundation of the information environment. People access to the BLE as "Environment," using "information tools" such as SNS and electronic bulletin boards. SNS and electronic bulletin boards are not only just tools for access but also serve to connect users to the environment. The combination of BLE, SNS, and electronic bulletin boards creates an "Information Culture" of spatial communication. If any of these elements lacks, the entire BLE Knowledge Community as "Information Environment" cannot be formed. Furthermore, by adding BLE as an element (the idea of certain limited community) to SNS, we can realize SNS or digital communication that is not dependent on a specific platform or location. BLE Knowledge Community can realize 'Sustainability' with which users' communications are possible anywhere.

F. “Digital Optique,” a System for Experiencing 19th-Century Video Expression

Regarding this case, we developed “Digital Optique,” an application for the experiential sustainability of Theatre Optique, a video projection device created in the 19th century. Digital

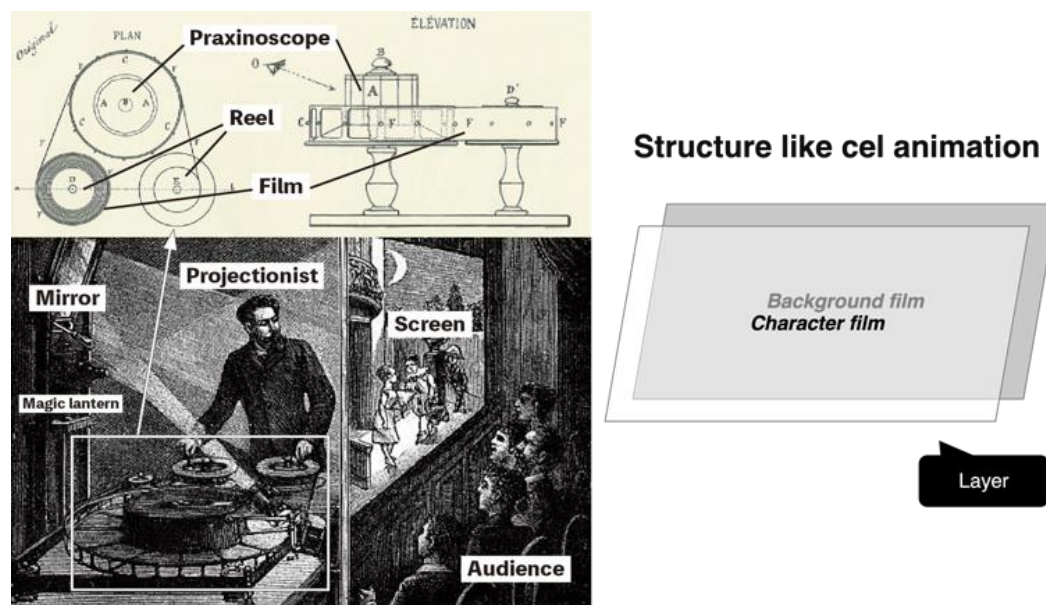


Fig.5 Theatre Optique Structure and Cel Animation

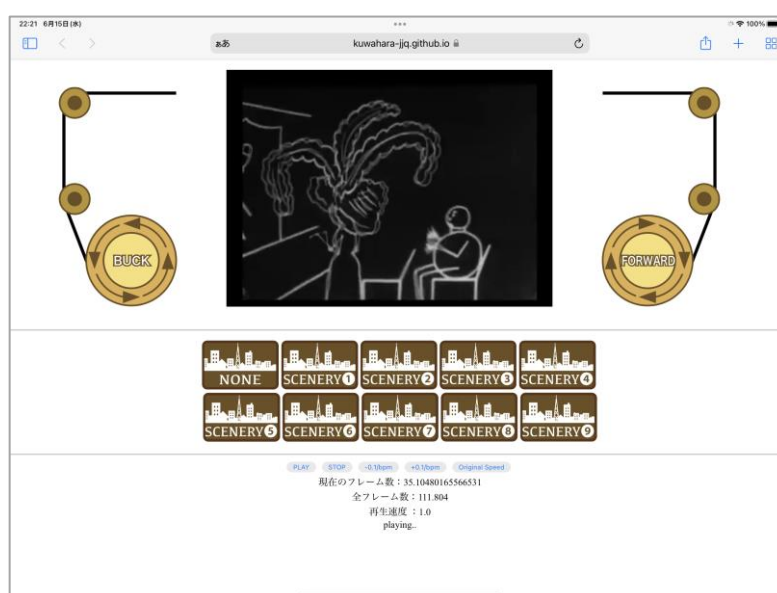


Fig.6 Digital Optique Development Screen

Optique was developed in an attempt to digitize the large, old machine called Theatre Optique, but this is not simply an application that reproduces retro or nostalgic images. It was designed to reproduce the experience that the art of playing a video on Theatre Optique requires the performer’s skills and practices. Today, the ease to manipulate video with a single tap to play, rewind, loop, skip has led to the lost existence of the “improvisational expression” as to video viewing. The method of screening of manually rotating the film and intonating the story while

checking the audience reactions, does not remain today. It can be said that the humans' ability evolution to develop visual expression had stopped in the 19th century due to the pursuit of the tool convenience and other factors. "Digital Optique" was devised as a pioneer to endorse that these lost technologies are not left behind. This is an example of not only taking over past devices to future generations but also making the art's representational activity sustainable and more handy with the times.

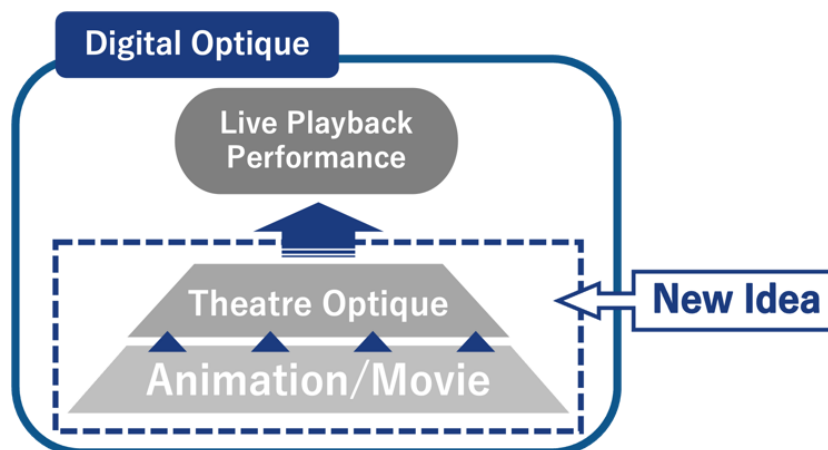


Fig.7 Configuration of Digital Optique's "Information Environment"

Figure 6 shows the development screen of Digital Optique. Digital Optique reproduces the workings of Theatre Optique, with the black square in the center playing the transparent background animation and the background image simultaneously. The user can play the animation frame by frame using the buttons at either end. The bottom ten buttons allow the user to select the background to be projected. The user can choose the speed of the animation and the background to match the mood, atmosphere, and imagination of the moment, thus creating a one-time-only animation.

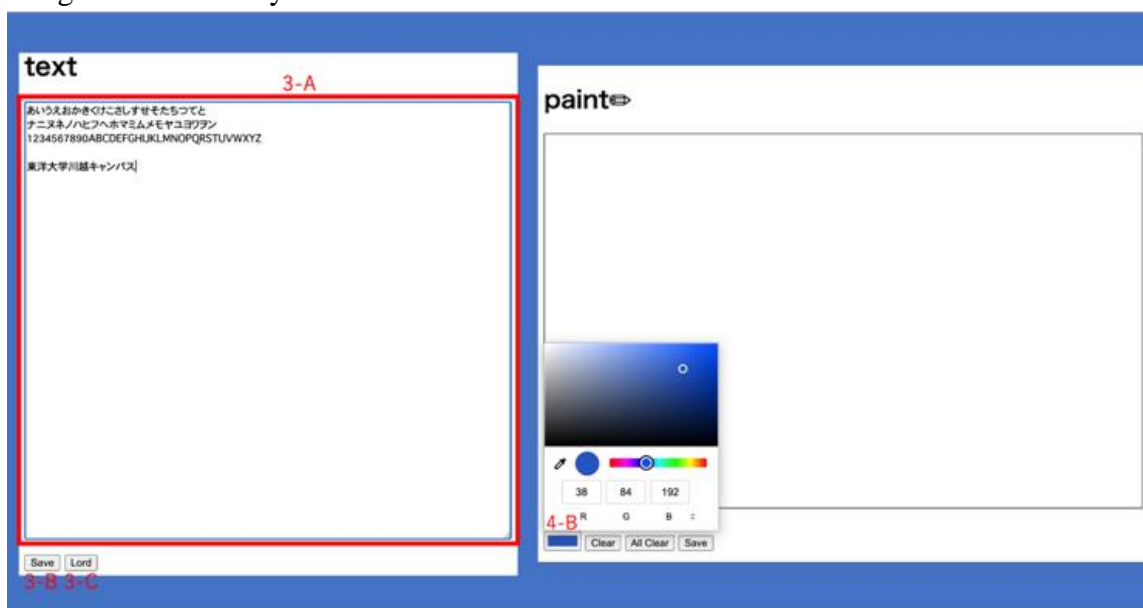


Fig.8 Functions of Data-Saving Office: 'Text Editor' and 'Paint Software'

The "Information Environment" that makes up Digital Optique is also shown in Figure 7. It

is an environment of animation and movies, and Theatre Optique is used as a tool to contact this environment. After the relationship between the “Environment” and “Information Tools” is established, an information culture of “Live Screening Performance” is formed with regards to Digital Optique. Today, we use digital devices such as smartphones, PCs, and TVs to view animations or videos, but by using the “Information Tool,” Theatre Optique, we can experience a lost technology and culture. Furthermore, by adding digitality to the Theatre Optique, Digital Optique will revive the culture of live screening performance and realize the ‘sustainability’ of technology and culture, including the surrounding experiences of the live screening performance.

G. Design of a Sustainable Office Environment Using Floppy Disks

In this case, we designed an environment for a data-saving office system on floppy disks, a storage media with a small data capacity. While floppy disks are said to have lost their value due to the birth of the Internet and the expansion of storage media capacities such as CDs and USB memory devices, we carried out a research focusing on a technology that allows data to be stored to the limit in a limited capacity. In the present age of unlimited data storage, incorporating an office system into the storage media with the smallest storage capacity indicates the need for creative twists of the data to be created.

This system contained on a floppy disk consists of a text editor, paint software, calculator, video player, and other applications with the minimum necessary functions and the minimum necessary design with high visibility. The minimalist design and maximum use of the smallest capacity storage media have realized a minimum data-saving Office system.

Floppy disks are now rarely heard of due to their reduced distribution, as their manufacture has been discontinued. While floppy disks have become a ‘lost technology,’ government offices and corporations still keep using them to store confidential information. It is difficult for users who have not updated their information environment to continue to use media with distribution has decreased in the market.

Information compression in SDG Informatics is not only about capacity compression but also about how people are able to wrap up their ideas. The concept of SDG Informatics is to pursue sustainability by using human sensitivity and creativity, which are abilities that cannot be replaced by machines.

Conclusion and Future works

This paper has listed examples of several types of information environments and discussed how they can be used sustainably. The “Information Environment” can be categorized into three elements: “Environment,” “Tools,” and “Culture.” Sustainability must be examined based on an understanding of the mutual relationship and roles of each. In order to realize a ‘sustainable’ society in which ‘no one is left behind,’ we must always be aware of the IT environment, IT tools, and media culture that are abound in our daily life and prevent their oblivion. Through this research, we would like to keep proposing ways to sustainably utilize the surrounding “Environment,” “Information tools,” and “Information Culture.”

Regarding each of the introduced case in previous chapter, the past and present “Information Environment” was explained as a way to revive lost technology for sustainability (the former

case), and also, to treat the “Information Environment” equally (the latter case). “Sustainable Informatics” defined in this study requires a multifaceted view of the concept of ‘sustainability,’ and the proposing methods are not limited to just one. We need to deeply consider what the word, ‘sustainability’ indicates. The SDGs in the information sector tend to focus on the pursuit of sustainability through the development and introduction of new technologies and the ways to reduce power and costs in order to sustainably utilize equipment and the environment. However, SDG Informatics will recapture the existing information environment in order to sustain it and improve the sociality and diversity of the information environment.

In the future, we would like to further develop case studies on SDGs Informatics. In addition to the three-factor categorization of the information environment, we would also like to structure the information environment and Sustainable Informatics by dividing the information environment into the external and internal aspects of sustainability.

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