

## **A study on the smart band, technologies, and case studies for the vulnerable group. - The Digital Age and the Fourth Industrial Revolution.**

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### **Abstract**

*This study aims to study non-rechargeable wrist-type smart bands for those vulnerable to the digital environment. The transition to the digital age means improving the efficiency of human life and the convenience of management. In the digital age, it can be a very convenient infrastructure for the digital generation, but otherwise, it can cause inconvenience. COVID-19 is spreading non-face-to-face culture. The reality is that the vulnerable are complaining of discomfort in non-face-to-face culture. The core of the digital environment is smartphones. Digital life is spreading around smartphones. Technology that drives the digital environment is the core technology of the Fourth Industrial Revolution. The technologies are lot, big data, Blockchain, Smart Mobility, and AI. Related technologies based on these technologies include digital ID cards, digital keys, and nfc technologies. Non-rechargeable wrist-type smart bands based on related technologies can be conceptualized. Through these technologies, blind people can easily access books and manage their ID cards conveniently and efficiently. In particular, access authentication is required wherever you go due to COVID-19, which can be used as a useful tool for the elderly who feel uncomfortable using smartphones. It can also eliminate the inconvenience of the elderly finding or losing their keys.*

**Keywords:** *The disabled, The underprivileged, Mobile ID, Digital Key, IoT, Big Data, Blockchain.*

## **1. Introduction**

The transition from analog to digital age implies that the efficiency and management of human life can be done numerically. Digital is the language of 0 and 1. We create and communicate the world with '0' and '1'. It can be seen that there is nothing between 0 and 1. Therefore, there is also criticism that it is not emotional. However, these characteristics improve our lives. If it is not 0 and 1, you may not be able to access the digital environment. This can cause tremendous inconvenience and mental panic for the underprivileged.[1] For example, considering switching to digital currency instead of currency, failure to access digital can cause

tremendous inconvenience and difficulties. This can be said to be the gain and loss of the digital environment. For the digital generation, this digital environment is a very convenient infrastructure, but it will be a disaster level for those who do not or reject it.[2] The basic social environment has changed digitally. The reality is that it is not providing sufficient satisfaction even though it supports the underprivileged through a parallel with analog.[3] In particular, society is rapidly changing into a non-face-to-face culture due to COVID-19. Although it provides various smart technologies using smartphones, it may cause inconvenience to the vulnerable. It is a time when smart bands are urgently needed for the vulnerable to conveniently use the digital environment.

## **2. Digital Environment and Core Technologies of the 4th Industrial Revolution**

### **2.1. Overview.**

The digital environment can be seen as the most basic infrastructure for us. There is a word called 'digital native'. Digital natives refer to the generation of a digital native who uses digital environments such as personal computers, mobile phones, the Internet, and MP3 players as if they were born from birth.[4]

Due to Corona, contactless culture is spreading, and the digital native generation is adapting to the changing living environment faster than anyone else. However, there are some classes who are unfamiliar with the digital environment or reject it, so they may feel socially discriminated or alienated.

### **2.2. Features**

The key to the digital environment is the smartphone. The popularization of smartphones can be seen as a representative digital device that has changed the way of life of mankind. Currently, smartphones are playing the role of a key that connects all digital devices when they act as a hub in the digital environment. The 4th industry based on digitalization has driven the explosive growth of digital life. Let's take a look at the core technologies of the 4th industry.

### **2.3. Core technologies of the 4th industrial revolution**

#### **2.3.1. IoT**

The Internet of Things (IoT) encompasses all objects ("things") that can connect to the Internet network, from plant equipment, vehicles, mobile devices, to smartwatches. Today, however, IoT is more specifically defined as things that are connected to each other and equipped with sensors, software, and other technologies that can send and receive data to and from other things. Whereas previously connectivity relied primarily on Wi-Fi, today's 5G and other types of network platforms can handle large datasets faster and more reliably.[5]

#### **2.3.2. Big Data**

Big data refers to massive amounts of data, and today, big data is already being used in various fields. For example, companies accumulate vast amounts of customer consumption patterns as data, analyze them, and use them for product recommendation services or new product development. Local governments use traffic information to provide intelligent traffic guidance services to citizens, and the National Police Agency also builds a crime prevention system by analyzing past crime data.[6]

### **2.3.3. Blockchain**

In early 2018, Bitcoin, a cryptocurrency, became a big social issue, and the source technology that makes this cryptocurrency possible is the block chain. Blockchain is an innovative technology that allows the transaction ledgers called blocks to be distributed and stored publicly by distributing them on individual computers rather than storing them on a central server. Since it is a technology that cannot be hacked and enables transactions between individuals without the intervention of an intermediary, the United Nations Future Report 2050 evaluated blockchain technology as one of the ‘top ten technologies that will change the future’. By utilizing the decentralization and stability, which are the strengths of blockchain, data can be managed safely, so it will be used in a wide range of fields such as interpersonal trading and trading, personal information management, and voting management.[7]

### **2.3.4. Smart Mobility**

Smart Mobility technology, including self-driving cars (or Autonomous Vehicles). Autonomous vehicle refers to a vehicle that drives autonomously without a human being, and advanced technologies such as high-speed 5G communication and Internet of Things are intensively applied to the vehicle.[8]

### **2.3.5. AI**

Artificial intelligence is the ability to understand human language, perceive and judge like humans, and it can be said to be the most advanced technology developed by mankind.

## **3. Definition of smart band and related technologies.**

### **3.1. Definition of Smart Band.**

Simple smart devices that reduce battery consumption and lower price range by simplifying functions than smartwatches are called smart bands. At first, it only supported LED alarms or pedometers without displays, but now it has a small color display and uses a pedometer sensor and gravity sensor to collect, record, record, and display health information or exercise information such as sleep quality check, stress check, walk and run. As generations progress, displays grow and resolution improves, and simple reply functions and automatic exercise tracking functions for messengers and text messages are sometimes added. [9]

### **3.2. A study for related technologies**

#### **3.2.1. Mobile ID card.**

Digital identification refers to an electronic identification card that proves an individual's identity and qualifications by storing digitized data such as a mobile driver's license and a mobile passport in IC card chips or smart devices.[10]

There are four main reasons why mobile ID cards are needed. First, non-face-to-face society. As the demand for non-face-to-face services increases, the need for new digital authentication means to replace physical identification cards is gradually emerging. Online financial services require real-name verification and have limitations in usability, such as having to undergo separate authentication for identity verification. Second, personal information protection. Existing ID cards contain important personal information, so sensitive information is exposed during the verification process, and there is a possibility of information leakage and theft in case of loss. Third, data sovereignty. As each country needs to disclose personal information and guarantee self-sovereignty, it is necessary to establish a system that allows them to authenticate themselves

and manage data without intermediaries such as the state or trust agencies.

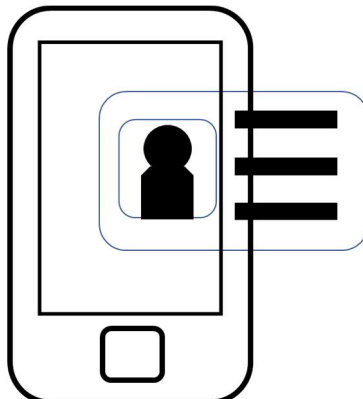


Figure1. Mobile ID

### 3.2.2. Digital key.

The simplest and most representative authentication means is the key, that is, the key. Owning a key itself indicates that you are a qualified person. In particular, mobile is used as a personalized device and itself is becoming an authentication medium capable of proving an individual. Digital keys that process user authentication on mobile devices can be used in various fields such as building access, vehicle opening, and closing, and start-up, security, and authentication technologies.

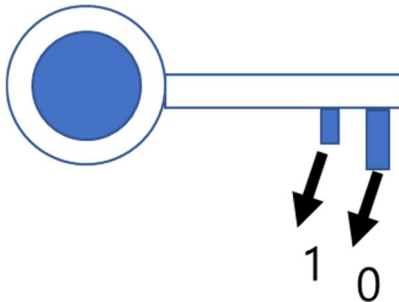


Figure2. Digital key

### 3.2.3. NFC.

NFC is short-range wireless communication within 10 cm in the 13.56 MHz frequency band. It belongs to one of the RFID technologies and is also compared to Bluetooth because data transmission and reception are possible.

There are three typical characteristics of NFC. First, NFC supports the function of reading and writing data. If RFID technology supports only one reader or tag function, NFC includes both reader and tag functions. Second, it supports the card emulation function. The external reader may recognize the terminal and use it for a mobile payment service. Third, it is Peer-to-Peer technology. When the two NFC terminals recognize each other's devices through simple contact, they easily transmit an address book, an image, a document, etc.

## **4. Case study of the underprivileged.**

### **4.1.1. Support case for the disabled**

In Korea, it also introduced a library service that reads books using LG Electronics' NFC technology. The visually impaired can download audiobooks or obtain information about books after user authentication using NFC-equipped mobile phones or dongles.[12]

Therefore, anyone with a smart band equipped with NFC can easily access the book.

### **4.1.2. Mobile ID Applicable Cases**

#### **4.1.2.1. Lost registration card for the disabled.**

Under the current law, the disability registration card in Korea is recognized as an identification card. However, unlike resident registration cards and driver's licenses, disability registration cards cannot be stopped if lost, so there is a risk of misuse.

Other ID cards are equipped with a management system that allows suspension and reissuance in case of loss to prevent possible problems, but disability registration cards do not have such a system.[13]

#### **4.1.2.2 Authentication and payment system.**

The elderly who cannot adapt to the unfamiliar digital environment feel uncomfortable and alienated.

Due to the coronavirus, QR code authentication is mandatory in most stores nationwide, and the payment system is also being unmanned and is experiencing difficulties. In addition, if the QR code is not authenticated within the set time, the screen turns off, so it is very difficult for elderly people who have difficulty using smartphones to perform QR authentication within 14 seconds.

It is not easy to issue an electronic certificate for the elderly who lack internet experience. In order to receive a personal QR code that can prove vaccination history, it is difficult because there are many people who are not used to using mobile devices, so a separate authentication procedure such as mobile phone authentication is required.

Some older people are being thrown out of restaurants because they don't have an electronic certificate even after getting vaccinated. Even if a vaccine pass is issued once, it has to be renewed over time, and the process of reissuing it continuously is necessary so makes it hard. [14] [15]

### **4.1.3. Digital key Applicable Case**

In January 2012, there was an accident an old man A crashed and died in an apartment in Jeonju, Jeollabuk-do. The cause of the accident is believed to have been that Mr. A, who forgot the house key, fell down while passing through the neighbor's veranda to open his house door.[16]

## **5. Conclusion**

COVID-19 is spreading a non-face-to-face culture. Non-face-to-face culture can be managed very conveniently and efficiently through related technologies based on the core technologies of the Fourth Industrial Revolution. This study is expected to be very helpful in improving the adaptation of the vulnerable to the digital environment. It was thought that there would be information gaps and social discrimination by

class in the digital age, but they suffered not only an inconvenience but also in basic things such as eating at a restaurant or buying something in a store. While some people easily use smart devices to pay, authenticate, and enjoy a greater amount of information, on the other hand, the gap was widening. Based on the results of this study, it is considered to study the proposal of a new smart band model by focusing on the needs of the marginalized in the digital age.

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