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A Comparative Study of User Identification for COVID-19 Vaccination Online Registration

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***Abstract*—Due to the COVID-19 pandemic, individuals have been encouraged to obtain COVID-19 vaccinations. As part of the vaccination process, it is necessary to verify the identity before obtaining the vaccines. Incorrectly identifying the individuals could lead to serious consequences. For example, an incorrect vaccination schedule (e.g., incorrect timing between doses and incompatible brands) may cause undesired side effects to an individual, so it should be more accurate and convenient to identify themselves whenever and wherever people are required. One of the most effective and commonly used identification methods is face-to-face (or offline) identification. However, the method is typically time-consuming and is not suitable for the current situation where individuals should avoid direct contact. Hence, there is a growing trend for an online identification method where individuals use digital credentials to identify themselves. This paper suggests an online authentication system for improvements by investigating how different people authenticate themselves online in each country for COVID-19 vaccination. Comparing the online authentication systems between a country that have their national identification cards or not makes the Pros and Cons of both systems clear, particularly, in Japan and Thailand.**

***Index Terms*—COVID-19, Online Identification, Digital ID**

I. Introduction

SINCE the COVID-19 is spread, it has been recommended to have the vaccination in most countries. The vaccination process must be correct to identify each person and make it easy to vaccinate many kinds of people. Currently, the reservation process is mainly online to avoid many citizens from gathering in person. The notable issues are to distinguish whether those who have done the required number of vaccination or not clearly in the defined situation and control individual vaccine data, authenticating themselves. That is why what to certify must associate with a national database to deal with data efficiently in that situation.

The governments of each country are required urgent different responses based on their identification contexts. For example, most people in the USA use mainly Social Security Number(SSN) to identify themselves, and Japan has identity cards as well, however, some people do not have a way to identify. On the other hand, almost all people in Thailand have a unique national identity card. Therefore, Japan has different contrast contexts to Thailand in identifying each person because there is no obligation to have a unique national identity card like those in Thailand have.

The main contributions of this paper are three-fold. The first is an investigation of common identification methods commonly used to identify individuals. The second is a detailed comparison between the identification methods used in Japan and Thailand to understand their advantages and disadvantages and how the methods work. The third is the proposal of an online identification method that is more secure and as convenient to use as the methods currently used in Japan and Thailand.

The remaining of this paper is organized as follows. In Section Ⅱ, we introduce related works about basic issues the current identity cards have. In Section Ⅲ, we summarize general authentication system in Japan, also present the COVID-19 vaccination flow. In Section Ⅳ, we analyze authentication levels based on situations in Thailand and explain the COVID-19 vaccination flow. In Section V, the Pros and Cons of authentication systems are presented. In Section Ⅵ, we recommend an online authentication system for improvements. In Section Ⅶ, we conclude this paper and descrive further work.

II. Literature review

Traditionally, identity cards are used to authenticate people in most all countries[1]. In Japan, there are many kinds of identity cards. Some of them are easily falsified because counterfeiting businesses exist, so it can not be determined if they are authentic or not. The effective measurement is to complement personal information without violating human rights. Identity cards should not refer to just name and biometric information but also a person's background. Additionally, to prevail identity cards with integrated circuit chips results in preventing them from counterfeiting, however, they have not spread well yet. Discussing how methods to use authentication can sort out these problems and realize correct authentication, compared to Thailand's authentication methods.

The certification of residence is used as a major social infrastructure in Japan, which means people in Japan are controlled by each province depending on their residence[2]. Every city hall manages the data and uses them for authentication on each person when enforcing public service, however,

the system could not work in Tohoku earthquake (11 March 2011) because of the power outage. Under this situation, it takes a lot of time to distinguish people who lose every identity card due to the disaster in addition to not generalizing a formal identity card. Volunteer medical workers confirm in person the patient's name and address[3]. Predictably, the current certification method will shift from physical certificates in visible form to media-information independent of them. A better way of authentication should work in these circumstances.

III. User identification in Japan

In general and formal, the number of required identity certifications is up to the difficulty to obtain and how accurate they are.

TABLE I
One is sufficient identification

One document	
· A driver's license	· A Passport
· A individual number card	· A welfare certification
· A certification of driving history	· A residence card for foreiner

There are a driver's license, a passport, and so on as one sufficient document to identify. Their specification is to attach a facial photo in addition to individual information.

TABLE II
Two are sufficient identification

Two documents	
mandatory one of them at least	any identify cards
· A certification of insurance	· A certification of residence
· A certification of national pension	· A issue from governments
· A mother and child health handbook	· A receipt of social insurance
· A certification of the stamp used for signature	· A receipt of public utility

On the other hand, if more than one document is needed for a person's authentication, at least one of them has to be from the list of mandatory documents, e.g. the certification of insurance or the certification of national pension. Japanese people have an obligation that they join one of the various insurance and pay a pension, so obtaining certifications like these is not harder than obtaining a driver's license and a passport. For example, when people create banking accounts on sites, in addition to those kinds of identification cards, people need a name stamp used for their signature and required identification to verify their name, address, and birthday. That is why can authenticate individuals more correctly because if they do not have the same name stamp used to enroll in the bank account, they can not authenticate themselves. They must inform the bank that they have lost their name stamp and create a new one in the name stamp shop. On the other hand, when people apply for a bank account online, they need two identity cards as follows. The required documents are more rigorous than the general situation.

- A driver's license
- A passport
- A individual number card
- A certification of insurance
- A residence card for a foreigner [1]

First, people take a picture of identity cards. Next, they fill out the blank regarding name, address, mail address, and place of work. Finally, SMS is sent by websites, then they confirm the numbers.

Hence, if people do not have any identity cards, they can not authenticate themselves in the required situation although it is not mandatory to have regularly their identity cards every time. Those who have a residence in Japan indeed have individual numbers for each person like the Thailand system, even if they are babies and foreigners, however, the individual numbers currently are required in only limited situations such as when you are hired. In conclusion, the main cards used as identification are the certification of insurance, the certification of residence, and a driver's license.

People must authenticate themselves in also COVID-19 vaccine situation. The incorrect certification caused some problems like the unexpected doses of different vaccine makers and abnormal time of vaccination, but high authentication security disturbs people from vaccinating conveniently. In Japan's vaccination process, the necessary factors are to have the certification of residence and a vaccine ticket written with individual numbers for the COVID-19 vaccine. When people vaccinate, they can even use only a certification of insurance without combining it with other identity documents, which becomes easier to vaccinate every people, unlike the general situation.

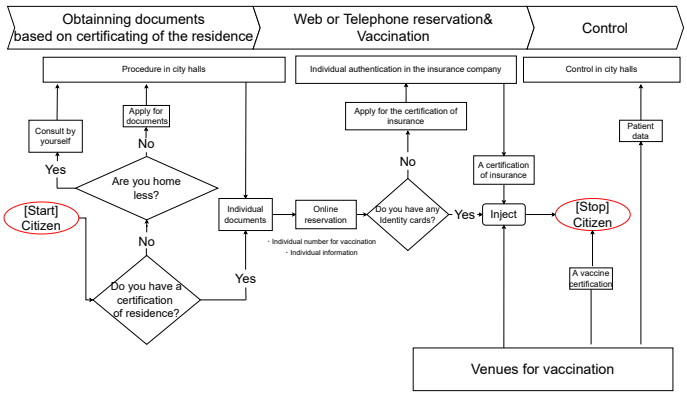

Fig. 1. Japanese vaccination flowchart

First, citizens could obtain the documents which include a vaccine ticket written with individual numbers for the COVID-19 vaccine, a medical history form, and guidance notifications from their city halls in their homes for the first time dose. That is why people who are homeless can not obtain them because they do not have the certification of residence, so they need to consult with city hall clerks by themselves. Only if people are not homeless, there are situations in that people could not obtain them automatically as follows.

- Japanese people who are not currently living in their home districts. This includes those that move to other

[1] It can not be combined with a passport

districts recently and those that are currently staying abroad.
- Foreigners who are staying in Japan for more than three months.

These people have to apply for documents to their city halls by themselves, and their city halls mail the documents to them.

After obtaining a vaccine ticket, there are mainly two ways of reserving a vaccination in Japan. One is that people could reserve the vaccination date and the venue through websites, filling the blanks requiring individual numbers for COVID-19 vaccine, name, birthday, phone number, and mail address. The other is through the telephone. People are asked about the same information as websites. In both ways, they do not have to show real identity cards, unlike online creating bank accounts. When they vaccinate in the hospital, they must bring the vaccine ticket, medical history form, and identity cards to identify themselves before vaccinating and controlling vaccine information. Exactly, all Japanese people have no less than the certification of insurance as identity cards because entering insurance is an obligation in Japan if only they are losing it or in the process of changing insurance. In any situation, they can obtain their one immediately based on insurance companies.

Finally, hospitals distribute and attach the vaccine certification to the vaccine ticket for people who have done vaccination, and it is used for authentication for second-time doses, combining individual numbers for COVID-19 and identity cards. Moreover, Hospitals have to inform city halls of patient data for COVID-19 vaccination. According to that, city halls control them and prevent from sending plural vaccine tickets to the same person. Since the end of last year, it has become possible to obtain vaccine certification through an app thanks to a digital agency organized by the Japanese government. To use it, people must have their individual number card with an integrated circuit chip, because the app use "near field communication (NFC)" technology through an integrated circuit chip. That is why people need to have NFC smartphones compatible with an individual number card.

IV. User identification in Thailand

In Thailand, every person who is at least 7 years old is legally obliged to carry a national identity card whenever outside. The national identity card is made from plastic with an integrated chip like a Japanese individual number card. While Japanese governments have tried to prevail against it, a similar card has already spread in Thailand. It is used for a variety of situations such as when people create bank accounts, obtain a driver's license, and enroll in insurance. The Thailand national card has included these information as follows, and which are controlled by Department of Provincial Administration(DOPA).

- Name
- Gender
- Birthday
- Religion
- Blood type
- Address
- 13 digits individual number

Every transaction is held online usually, using them in general. Electronic Transactions Development Agency(ETDA) has made a definition of what kinds of identification citizens should need based on situations. It is called Identity Assurance Level(IAL)[4]. The certification levels are different though people use mainly their national identity cards.

TABLE III
The IAL layers

IAL levels	What people need
IAL 1.1	No identification
IAL 1.2	A copy of the national identify card A copy of a passport
IAL 1.3	The real national identify card A real passport
IAL 2.1	The integrated chip data extracted from the national identify card and confirming phone numbers Reading the NFC data sent from a passport and a taking facial photo
IAL 2.2	The integrated chip data extracted from the national identify card, cheking authentication with DOPA data base and confirming phone numbers Reading the NFC data sent from a passport and taking a facial photo
IAL 2.3	The integrated chip data extracted from the national identify card,cheking authentication with DOPA data base and confirming phone numbers Reading the NFC data sent from a passport and taking a photo of IC chip and facial photo, comparing with biometric certification
IAL 3	The integrated chip data extracted from the national identify card,cheking authentication with DOPA data base, confirming phone numbers and meeting in person or virtual

Unlike Japan's identification system, whenever need to certify, citizens use the unique identification card in Thailand. To select the most appropriate identification[5], IAL levels help agencies decide which ways to identify people are appropriate for their digital service demands. Particularly, in the COVID-19 situation, the level of online reservation and vaccination protocols are included around IAL 2.

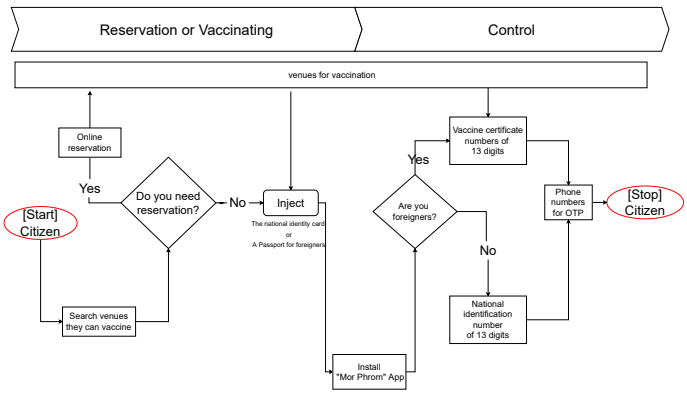

Fig. 2. Thailand vaccination flowchart

First, citizens search the venues for vaccination and could go there even if they do not reserve in advance as well as foreigners. Next, it is required to show only the national identity card or passport to identify in the venues. This is how they can vaccinate smoothly for the first time. Finally, "Mor Phrom" is spread to certify the COVID-19 vaccination. Citizens need only three steps with the required identity documents. The first step is to enter 13 digits numbers with the national identity card, so they are used instead of the individual numbers issued for a vaccination ticket in Japan. In the case of foreigners, the venues issue the specific 13 digits numbers for the vaccine certification. The next step is to enter the phone number to send One Time Password(OTP). After that, once set the original password, it certifies the vaccination information whenever and wherever citizens want to show it. Therefore, the level of the vaccine certification process is included in IAL 1.1 because they use only 13 digits numbers.

On the other hand, there are other apps requiring more accurate authentication in Thailand. For example, in addition to the use of the 13-digit number, more secure approaches have been introduced in the Tang Rat app launched by the Digital Government Development Agency. It has four steps to identify a person as follows.

1) Take a picture of the national identity card to scan information, using optical character recognition technology.
2) The system check statements exactly, which is the same way to confirm the identity of the taxpayer.
3) Take a movie to compare the facial photo in the national identity card, using a high-reliability way of animation.
4) Set Password for requiring a login.

Hence, this certification level is included in IAL 1.3. From now on, it will be used as an innovation applying a digital platform to support government services via digital systems.

V. Comparison and Discussion

Comparing each context in both countries helped summarize the Pros and cons of the identification systems in Japan and Thailand. In Japan, the certification of residence is used to identify mainly and basically from a long time ago. It has two functions that register our addresses and certify themselves, going through changes along with historical problems. The government has distributed some profits per residence[6]. Now, it is in still time to adapt to changing the demands of society. That is why the individual number card is spread to prevent falsification more strictly.

The reasons the national individual card has not spread are not relating a function and an efficiency standpoint but political aspects. It is sometimes difficult to identify a person in terms of the used technologies. In the case of COVID-19 vaccinations, the required identification procedures are less rigorous because the government has to encourage the citizens to vaccinate.

On the other hand, in Thailand, the national individual card was issued to control the information of the population in 1909[7]. Currently, it is mainly used for identification in a variety of situations, associated with a national individual database.

TABLE IV
Pros and cons about identification system in Japan

Japanese online identification system	
Pros	Cons
· Easy to understand Japanese political contexts	· Need to apply for some identifications by ourselves
· Due to the World War II, we reluctant to have an individual card	· Possibilities of falsification
· a variety of identification cards	· Most of identification cards do not associate with national individual database

TABLE V
Pros and cons about identification system in Thailand

Thailand online identification system	
Pros	Cons
· The national individual card associates with national individual database	· The high risks of leaking individual informaiton
· Easy to obtain the identification card	· Most of services linked the specific card
· People tend to remember individual numbers	

As for the Pros, the identification system in Thailand improves the Japanese identification assignments. Moreover, as long as people remember their numbers, that might be helpful to distinguish them even in a disaster. In practice, the Mor Phrom app requires only individual numbers to authenticate. The government did not have to distribute new issues, unlike the Japanese vaccine ticket. Having a national identifying card for everyone promotes easily implementation of national policies.

VI. Reccomendations

As a result, concerning both countries' authentication, a national identity card should be spread like a Thailand one even in Japan. There are four required main factors in this card. The first factor is that the card should include an integrated circuit chip to prevent its falsification. The second is to associate it with a national database by using individual numbers. When governments implement policies, it works helpfully to record and control them. The third is that it should be easy to obtain and free to apply for, unlike a driver's license. Fourth is to attach a facial photo for certification with individual information on the card. According to the Japanese authentication, it found out to need to show a facial photo in the correct document to authenticate. Following these factors, the card will become the basis of certification and relate to a new online authentication system.

To show a real identity card by each time to identify leads to the possibility to leak individual information and the high risk of losing the card every time. For sake of avoiding that danger, the better authentication method is to introduce an identification digital ID shifted from physical certificates independent of each person, even though in person.

That is realized through an app that fits the requirements that it is possible to identify as long as entering OTP used phone number or e-mail and verifying by facial recognition or password after showing a real identification card only in the enrollment.

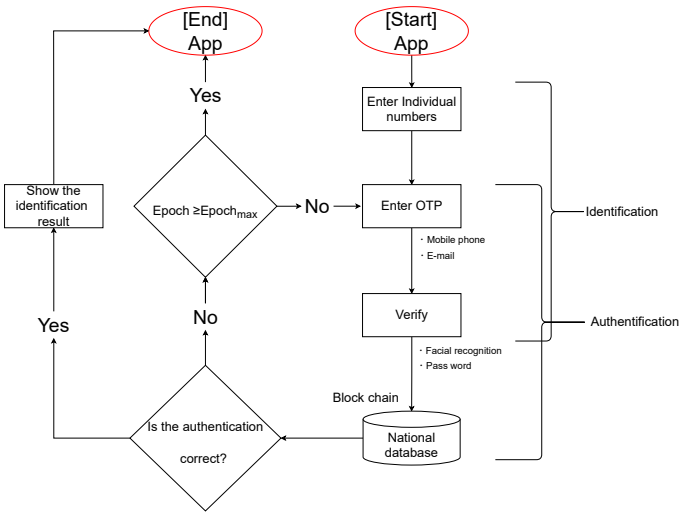

Fig. 3. The app identifying flowchart

The app connects national database storing individual information based on an identity card. The data are protected by blockchain technology, and also it records access logs, then sends a notification alert to users. Currently, there is a similar system in Thailand. It is called the National Digital ID platform(NDID). This system is available via the Bangkok Bank Mobile Banking application for Thai nationals. In the enrollment, people use citizen ID card information, OTP received via SMS and facial recognition. If they are going to certify, a digital process via NDID allows users to apply for particular services that request digital authentication, using facial recognition verification. A problem is the cost of introducing everywhere. They can not use this platform wherever they want to introduce it. It is important to think about how to save the cost and be available for every case.

VII. Conclusion and Further work

This paper seeks a better authentication method online, comparing the countries which have contrasting authentication systems in COVID-19. The ideal system should promote more accurate certification, avoid leaking individual information, be independent on a physical real card, be easy to introduce for everyone, and serve the same IAL levels in a variety of situations. There are two challenges to be addressed in implementation. One is that a national identity card must be spread widely first as realizing this system, however, Japanese encounter slow dissemination of a national identity card with an integrated circuit chip. Gaining an understanding of Japanese people is significant to solving this problem. The other is to develop a required app, saving cost to introduce it wherever it is needed indeed from now on. Through this app, it becomes possible to certify people online and offline via a national database even though they do not show a real identity card every time. That results in decreasing the risk of stealing individual information. The future authentication method could be reliable on an invisible digital thing.

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