



EFFECTIVITY OF DIGITIZED HEALTH INFORMATION CARD

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Abstract: With the emergence of new Coronavirus Disease (COVID-19) variants, the COVID-19 pandemic remained a global concern. As a result, the constant need to improve efficiency and credibility while preserving safety measures is of utmost priority. Going paperless is a great way to control the pandemic, and Quick Response (QR) code is an effective way to promote paperless transactions. The researchers incorporated the QR Code and Google Form into the Digitized Health Information Card. The researchers then assessed the QR Code's effectiveness based on its accessibility, convenience, and the difference between the satisfaction of using digitized health information cards and manual writing. The researchers used SoGoSurvey forms called Product Evaluation and Overall Satisfaction Survey to measure the satisfaction and effectiveness rate of the Digitized Health Information Card. The researchers also used weighted mean to identify its effectiveness using 50 students as respondents who filled out the Google Forms posted on the Facebook page. Based on the data, positive feedback on the accessibility and convenience of using Quick Response code had been interpreted as accessible and very convenient. The findings show that the respondents were very satisfied with filling out digitized health information forms while somewhat unsatisfied with writing manually. As a result of the significant difference, the Quick Response Code is more effective in student welfare.

Keywords: Google form, QR code, TAM Theory, satisfaction survey, COVID 19

I. INTRODUCTION

The fight against the COVID-19 epidemic will be long and arduous, with unforeseen twists and turns. Although, we have already learned one of the most important lessons: early planning and execution are critical in recognizing, controlling, managing, and preventing the spread of potentially dangerous new infectious disorders. Nations worldwide followed

exceptional regulations to isolate their populations from others, even in their homes [1]

Consequently, there is an on-going demand to enhance efficiency and maximize credibility while maintaining safety protocols. Going paperless is an excellent way to accomplish this, and one of the best ways to promote paperless transactions is using the Quick Response (QR) Codes. The QR code was created, implemented, and tested, intending to swiftly decode data and make it simple to make and utilize these codes [7]. The Quick Response (QR) code is a highly secure management system that encrypts all sensitive data stored and delivered. It is simple and cost-effective [13]. QR also includes a wide range of error correction features. Up to 30% of data that has been obliterated or corrupted can be retrieved [11].

In 2018, research was conducted about QR codes to access medical data at the University of Rhode Island. The QR code they utilized was only accessible to Apple mobile devices. The QR code stated in the study can only work when scanned within the researcher's application. Although the first creation of the QR code was in 1994, it was not until recently that the general public had access to them. When the iPhone 2007 was released, just 35% of the adult population in the United States had a smartphone, severely limiting QR code accessibility. Nevertheless, researchers should think of another way to make it more accessible to the public.

According to the Mobile Operating System Market Share Philippines statistics, 89.38% of the market shares come from Android phones, and 9.95% are from IOS [16]. Furthermore, addressing this issue will benefit the majority as it will be more accessible and efficient.

Similarly, research about a QR code-based contact tracing framework has been conducted in 2020. The proposed contact tracing framework will be an approach to assist the return to regular activity. This study concluded that the used framework has significantly controlled the spread of COVID-19. However, the downside of this research is the use of mobile apps for individuals. According to a survey, 61% of users expect mobile apps to start around four seconds; 49% want a



response in two seconds. So, if an app freezes, has errors, or crashes, 53% of users will uninstall it [24].

The increase in global smartphone usage led to the massive adoption of QR Codes, which penetrated the market from 59.01% in 2017 to 78.05% in 2020. The internet users have also advanced from a percentage of four from January 2021 up to January 2022. This expansion has caused the use of Quick Response to be scanned in smartphones more than any other devices. Smartphones are deemed to have a high effectivity rate with their usage compared to any other devices. [19]

Mobile devices can scan and understand QR codes with damage. The four error correction levels offered are L–Low, M–Medium, Q–Quartile, and H–High. The error correction level defines how much of the QR Code can be contaminated while still allowing the data to be recovered (L–7%, M–15%, Q–25%, and H–30%) [14].

Additionally, a study at Addenbrooke's Hospital in the City of Cambridge has produced a poster with QR codes that link to paediatric patient information e-leaflets to improve access. Moreover, this study shows positive feedback from both patients and clinicians. Patients said it was 'much eco-friendlier,' 'offers a wider variety of information,' and 'more convenient,' yet others said they preferred paper leaflets. Clinical feedback revealed that 70% of physicians found the poster "extremely" or "very" useful, and 60% "strongly agreed" or "agreed" that having the sign prompted them to ensure patients left with a leaflet after their session. [17]

Moreover, for paediatric patients and their parents, QR code posters offer a novel technique to improve the accessibility and availability of printed medical information. Aside from saving paper, the sign is also timeless. The QR codes do not need to be updated when the e-leaflets on the internet are updated. Overall, the patient and doctor feedback on these QR code posters has been favourable, and we are working on more posters to test in different specialties.

In line with this, according to Brodie et al., in their study on using the Quick Response (QR) Codes in Medical Education, QR codes are trusted tools for increasing access to internet resources such as movies, images, and instant responses in presentations, posters, and publications [2].

With the rise of multi-campus interdisciplinary projects in academic institutions, tracking systems that make device and sample data and accompanying outcomes accessible to all collaborators are becoming more critical. Manual data can get the job done, but it usually comes at a price. When a person converts from manual to computerized data entry, that individual eliminates several possible problems. There are a few drawbacks to manually entering data. Human mistake is one of the most severe drawbacks. Faults are unavoidable when an individual relies on a person to transfer data correctly from one location to another. It is a recipe for errors with eye strain, inattentiveness, and difficult-to-read material [25].

A paper-based document management system is required to efficiently manage the expanding number of paper documents. However, when comparing this method to digital platforms,

consider several drawbacks before deciding on the best way to keep information safe and accessible. Thus, many countries' lockdown and physical distancing measures contributed to a shift in activity on online platforms. Online platforms can help mitigate the detrimental consequences of future shocks that will disrupt physical activities [21].

Google Forms is a cloud-based data management application for creating and designing web-based questionnaires. According to Cleave, an online form like Google Forms is a simple, safe, and easy way to collect data scaled to fit teams of any size. With the correct online form design tool, people can rapidly create responsive layouts that take and save data. Web forms are user-friendly, transparent, and instantly editable, allowing transition to a paperless environment in a few simple steps [5].

With the lower cost of administering questionnaires, the capacity to reach out to a broad community, geographical and temporal advantages, and the ease of reaching out to a unique group, online surveys or Web-based surveys have grown increasingly popular. Google Forms collects data for a small study in the library and information science utilizing a web-based survey. Thanks to the tool's free availability and automatic recording of user responses in its spreadsheet, data gathering and analysis are now straightforward. Web-based survey tools may become the natural choice for survey research in India or any other country where internet-based users increase each day [20].

The researchers aim to effectively use Quick Response Code for the Digitized Health Information Card with the stated advantages. The researchers used TAM theory to support the claims of effectivity. According to Adam Ducey, the TAM includes the fundamental factors of technology acceptance and user behaviour, Perceived Ease of Use, and Perceived Usefulness [8]. Perceived usefulness (PU) refers to a character's belief that adopting a specific method or technique can increase productivity or everyday duties. Moreover, the Perceived Ease of Use (PEOU) is the degree to which a person believes that utilizing a particular system would be simple and comfortable; in other words, ease of use implies a lack of complexity and complication.

The more valuable the benefits and convenience of using QR codes, the more likely consumers will be willing to utilize them. According to the TAM theory, the interaction of the two factors—perceived utility and perceived ease of use—leads to a user's intention to use the technology (behavioural intention to use), leading to actual system use [23].

Additionally, schools need to focus on keeping schools free from the COVID-19 virus. That is why schools need to adapt the usage of health declaration forms or surveys from different establishments. Unfortunately, the boundless used paper goes to waste [15].

Another essential aspect of employing technology, according to Aguirre (2016), is going paperless. The QR code was created, implemented, and tested to swiftly decode data and make it simple to make and utilize these codes[6]. The stated



classroom innovation grabs students' interest and motivates them to come to school every day. The learners from General Emilio Aguinaldo National High School at Imus, Cavite, who used the QR attendance control and barcode scanner, exhibited significant improvements in terms of student attendance in this experiential study. As a result, it encourages kids to be motivated [15].

Sahaj, said that filling out a paper-based survey takes time. It takes a long time to administer paper-based surveys. Due to the manual nature of the procedure, time spent transferring data from the collection site to the hub of data assimilation and analysis is unavoidable in paper-based surveys. When transferring data from paper-based surveys to computers for digitization and research, there is the potential for errors due to lapses in human attention [22].

Employing technologically advanced alternatives is a solution to overcome the disadvantages of paper-based surveys. Keeping track of all the response sheets used in paper-based surveys can add extra weight. Paper sheets can also suffer from wear and tear during shipping and storage. Hence, in QR code innovation, everything is done in digital format, which minimizes paper usage, making it paperless and eco-friendly [15].

In the study of Firmansyah, about QR codes in Smart Attendance, respondents are satisfied with using QR codes with almost every item at a high level, such as displaying the information that meets the needs, quickly accessing information, and using signs at information service [9]. Furthermore, the number of data service points is sufficient.

Moreover, The Quick Response (QR) Code will act as a top provider of innovation that ensures the health of the youth, faculty, and non-faculty in the academe through the best and high-performance inventions. Additionally, it can play a vital role in gathering and exhibiting students' health data/history. These will also pave the way in lessening the waiting time in line due to filling out a health declaration form, where paper can serve as a medium for cross-contamination of bacterial pathogens, and following social distancing might be forgotten.

The researchers have chosen to make data collection easier by using Google Forms and presenting the data acquired through QR codes to recapitulate. They have utilized both tools to summarize and obtain the data needed critically. With this in mind, the researchers have carefully selected these approaches to scrutinize and ensure the study's objectives.

Everyone should be engaged in the students' journey to achieving excellence in education without compromising their health in the new normal. Thus, the researchers believe that having these QR codes at the back of the Identification Card (ID), which smartphones or devices can scan, is the most convenient way to show factual information or history regarding medications or allergies. First responders can check the patient's QR code to access healthcare records and intervene appropriately in an emergency. Thus, people can

utilize the time spent asking for details to save the patient's life.

II. OBJECTIVES OF THE STUDY

The preeminent purpose of this study is to contribute in minimizing the risk of reopening schools by using QR codes for Digitized Health Information Card. To be specific, the researchers intend to address the following questions:

1. What is the effectivity rate of QR Code in terms of:
 - 1.1 accessibility,
 - 1.1.1 place,
 - 1.1.1.1 rural area, and
 - 1.1.1.2 urban area;
 - 1.1.2 device/cellphone, and
 - 1.2 convenience / loading time?
2. What is the satisfaction level perceived by the respondents in terms of:
 - 2.1 filling out Digitized Health Information Form via Google Form, and
 - 2.2 writing health information manually?
3. Based on findings, what recommendations can be drafted in using Quick Response Code for Digitized Health Information Card?

III. METHODS

A. Study Flow

The creation of the Digitized Health Information Card has undergone different processes. First, the researchers used Google Forms to collect data on the students' health information, as depicted in Figure 2. Google Forms is a cloud-based data management application for creating and designing web-based questionnaires. Google Inc10 offers this tool. It is free to use and can construct web-based questionnaires, and is available on the internet for anybody to use [10]. Google Forms has become a popular solution in online survey research because of its accessibility and other benefits, such as unlimited surveys and 100% free [20]. After that, the collected data was imported to their health information card using a Google sheet where each student has their card, which the researchers themselves made. The Import Range formula is a function used to bring data from one spreadsheet to another, as seen in Figure 3. After the data has been transferred, the sheet is shared and published on the web, as seen in Figure 4. Google Sheet is an excellent tool as it is updated in real-time; if the students intend to change their details, the information on the web will also be automatically adjusted. Afterward, the researchers copied the digitized health information card link to create their unique QR Code using QRcode-monkey.com. This website is a precise QR code scanner and generator. It is one of the most popular online QR Code generators, with millions of already created QR Codes. QR Codes are machine-readable codes made up of an array of black and white squares commonly used to store URLs or other data for scanning by a smartphone's camera, as shown in Figure 5.



Upon receiving their QR Code, the student will evaluate the digitized health information card. The research utilized Technology Acceptance Model Theory to support the claims of effectivity. The TAM theory utilizes two fundamental factors: the Perceived Ease of Use and Perceived Usefulness.

With this, the respondents will then evaluate it based on its accessibility and convenience. Next, the students assessed the digitized health information card and manual writing satisfaction levels.

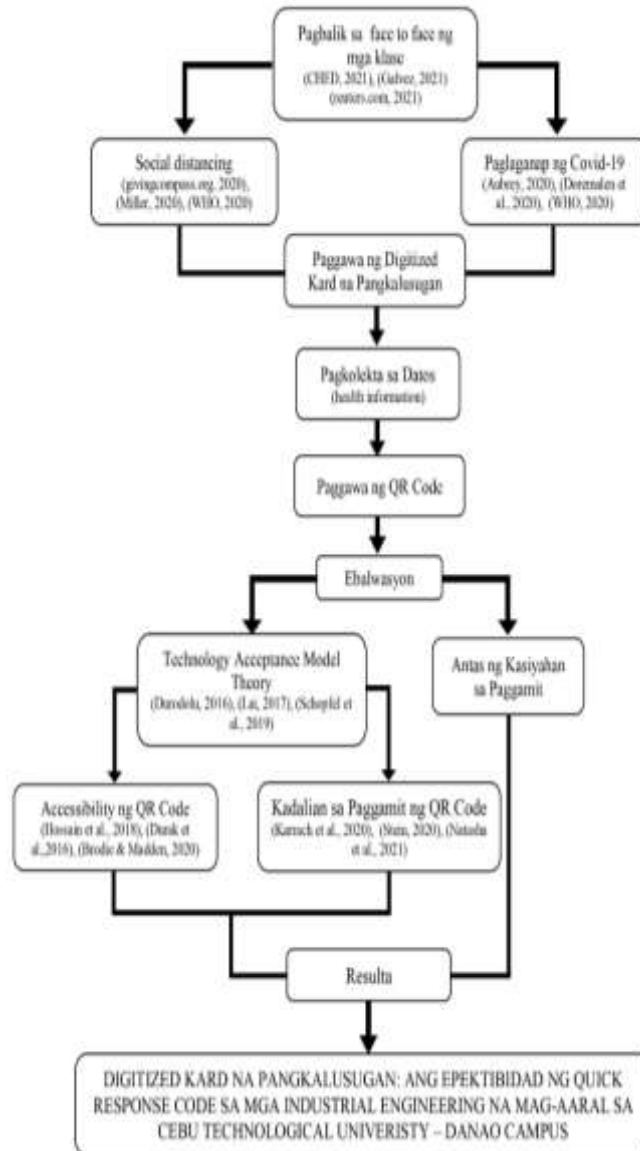


Fig. 1. Study Flow



The screenshot shows a Google Forms interface titled "Health Declaration Form". It contains several sections with radio button options:

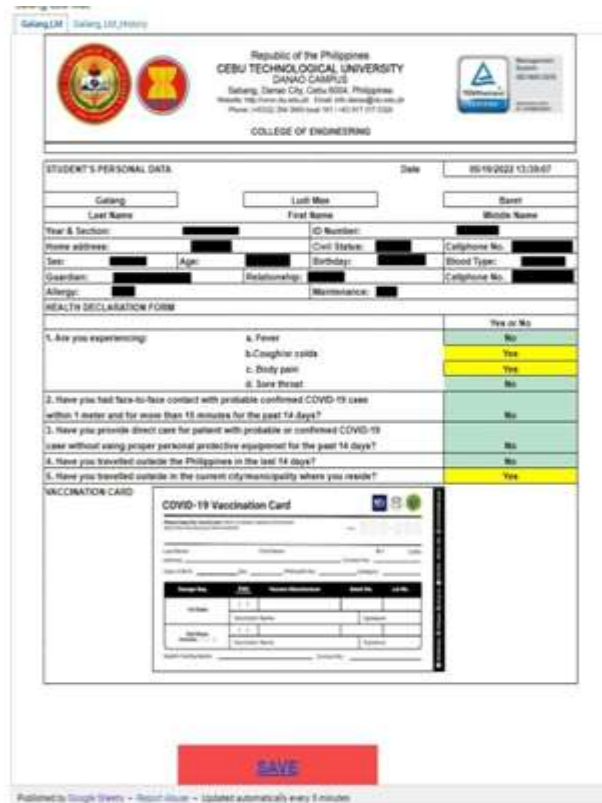
- 1. Any symptoms?** with options "Yes" and "No".
- 2. Fever?** with options "Yes" and "No".
- 3. Cough/sore Throat?** with options "Yes" and "No".
- 4. Body Pain?** with options "Yes" and "No".
- 5. Travel?** with options "Yes" and "No".

Fig. 2. Google Forms

The screenshot shows a Microsoft Excel spreadsheet containing a form for "CEBU TECHNOLOGICAL UNIVERSITY (DANAG CADIZ)". The form includes fields for "STUDENT'S PERSONAL DATA" and a "HEALTH DECLARATION FORM" table. A red box highlights the formula bar containing the text: `=IMPORTFORM("https://docs.google.com/forms/d/e/1FAIpQLSfWw-7C3uGd-C0a6h3hd-8g-p108702", Form2)`. Below the form is a red "SAVE" button.

HEALTH DECLARATION FORM		YES OR NO
1. Are you experiencing	a. Fever	No
	b. Cough/sore	Yes
	c. Body pain	Yes
	d. Sore throat	No
2. Have you had close-to close contact with probable/confirmed COVID-19 case within 7 meters and for more than 15 minutes for the past 14 days?		No
3. Have you provide direct care for patient with probable or confirmed COVID-19 case without using proper personal protective equipment for the past 14 days?		No
4. Have you traveled outside the Philippines in the past 14 days?		No
5. Have you traveled outside in the current city/municipality where you reside?		Yes

Fig. 3. Import Range Formula



Republic of the Philippines
CEBU TECHNOLOGICAL UNIVERSITY
 DANAOG CAMPUS
 Sabang, Danao City, Cebu 6004, Philippines
 Website: <http://www.ctu.edu.ph> Email: info@ctu.edu.ph
 Phone: +6022 264 2691 local 911-1402 911 277 222

STUDENT'S PERSONAL DATA Date: 05/19/2022 13:28:07

Category: Last Name: First Name: Middle Name: Sex: Age: Civil Status: Blood Type: Guardian: Relationship: Maintenance: Allergy:

HEALTH DECLARATION FORM

Question	Yes or No
1. Are you experiencing: a. Fever b. Cough or sputa c. Body pain d. Sore throat?	No Yes Yes No
2. Have you had face-to-face contact with probable confirmed COVID-19 cases within 1 meter and for more than 15 minutes for the past 14 days?	No
3. Have you provide direct care for patient with probable or confirmed COVID-19 cases without using proper personal protective equipment for the past 14 days?	No
4. Have you travelled outside the Philippines in the last 14 days?	No
5. Have you travelled outside in the current city/municipality where you reside?	Yes

VACCINATION CARD

COVID-19 Vaccination Card

SAVE

Fig. 4. Health Declaration Form



Fig. 5. Quick Response Code

B. Location of the Study

The research environment was located at Sabang, Danao City. Specifically, the researchers gathered the data from the students studying at Cebu Technological University's Danao Campus. The researchers find its locality suitable and appropriate for the present position of the student-researchers.

C. Respondents

The respondents for this study are the students taking Industrial Engineering courses. Industrial engineers create innovative and efficient organizations by combining people, information, materials, and equipment. Thus, Industrial engineering students as the respondents are valid. Moreover, according to Bullen, a maximum sample size that can give a reasonably accurate result would be 10% of the whole



population, as long as it exceeds 100 but does not exceed 1000 [3]. The entire population for the Industrial Engineering course is 456 students, which makes it valid for the criteria. For the reasons mentioned above, the researchers randomly selected fifty (50) respondents from the Industrial Engineering department of the Cebu Technological University- Danao Campus through the Simple Random Sampling Method. The Simple Random Sampling Method refers to a randomly chosen sample according to the needs of the study. Therefore, each member of the population had an equal chance of being selected as the subject.

D. Instruments

The researchers used an observation method to have organized and structured test results. The observation sheet serves as the data holder of the test's results gathered. To record the satisfaction and effectivity rate of the Digitized Health Information Card, the researchers adapted SoGoSurvey forms called Product Evaluation and Overall Satisfaction Survey. SoGoSurvey is a cloud-based SaaS (Software as a Service) platform for creating, distributing, and analyzing surveys, forms, polls, quizzes, and evaluations in several languages. Computer Engineers established the stated company in 2013 in Herndon, Virginia, USA.

E. Data Gathering Procedure

The research study had undergone different processes before the study reached maximum development. The first process of gathering data was through accumulating the students' health information through online platforms. The respondents filled out the Google Forms with their health information, reflected in their Digitized Health Declaration Forms. Next, the researchers created Quick Response Codes where each respondent had their QR Code which contained their health information. After, the respondents assessed the given Quick Response Code through an evaluation form collected, organized, and tallied by the researchers.

F. Treatment of Data

This section demonstrates the researchers' statistical technique in treating and analyzing the data collected during the conduction of the survey. The data gathered from the respondents were evaluated and analyzed using this quantitative tool, the weighted mean. The weighted mean determined the effectivity rate of QR Codes. It dictated the respondents' level of satisfaction with writing health information manually and filling out a digitized health information form.

IV. RESULTS AND DISCUSSION

Table 1. Effectivity rate of QR Code

Effectivity Rate of QR Code	WM	Interpretation
Accessibility		
1.1 The QR Code was easy to use in my residential area:		
1.1.1 Urban Area	6.47	The QR Code is very accessible in urban areas.
1.1.1 Rural Area	5.5	The QR Code is accessible in rural areas.
1.2 The QR Code was easy to scan in my chosen device:		
1.2.1 Cellphone	6	The QR Code is accessible in cellphone devices.
Convenience		
2. The QR Code did not take time to load.	6.2	The QR Code is very convenient.



TOTAL AVERAGE WEIGHTED MEAN	6.04	The QR Code is effective.
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Table 1 shows the accessibility rate of QR codes. The result indicates that the QR Code is accessible in the urban area with a 6.47 weighted mean. On the other hand, the respondents from rural areas find the QR Code accessible, having a 5.5 weighted mean. Additionally, the QR Code gained a 6 weighted mean which depicts that QR Code is accessible on their chosen devices.

QR codes require no special scanner making them simple to decode and convenient. Mobile phone cameras can directly read and display the information contained in the codes. With

this, it can be read by any device and from any location using mobile devices [6].

The QR Code did not take time to load, having a 6.2 weighted mean which was depicted as very convenient. Just like what its name suggests, QR Code means Quick Response Code. These codes are in conjunction with black modules (black square dots) arranged on a square grid against a white background. These modules contain specific data, a finder pattern, and an alignment pattern that allows scanning equipment to read quickly [12]. Furthermore, the QR Code has a total average weighted mean of 6.04, making it effective.

Table 2. Satisfaction rate of Digitized Health Information Form (Google Form) and writing manually

Satisfaction in Digitized Health Information Card and writing manually	WM	Interpretation
2.1 Satisfied in filling out Digitized Health Information Form	6.68	The respondents are very satisfied in filling out Digitized Health Information Form.
2.2 Satisfied in writing manually	2.88	The respondents are somewhat unsatisfied in writing manually

Table 2 shows the satisfaction rate in filling out Digitized Health Information Form and writing manually. Based on the data gathered, the respondents are very satisfied with Google Form as a Digitized Health Information Form tool, with a weighted mean of 6.68. As defined by Penn State University, Google Forms is a tool for creating accessible forms. It only requires a Google account for the respondents and creator to access it [18].

The data gathered shows that the respondents were unsatisfied with writing manually and got a weighted mean of 2.88, which was somewhat unsatisfied. Google Forms, without a doubt, can make our day easier and allow us to implement things more professionally and quickly. With this, manual writing is not the best option in this new normal.

V.CONCLUSION

The utilization of QR Codes for Digitized Health Information Card can minimize the risk of re-opening schools. The stated method decreases physical contact upon entering the school premises. It also timelessly showcases students' medical

records and health history and provides a transparent approach to reducing paperwork while increasing the university's health security.

Digitized Health Information Card is also advantageous to the school clinic as it provides opportunities for students to have a better health information system at school. Thus, the researchers recommended utilizing the Digitized Health Information Card in the re-opening of the classes.

VI.RECOMMENDATION

The researchers recommend utilizing the Digitized Health Information Identification Card to minimize the risk of reopening the schools based on the findings. Subsequently, the school administration must provide a QR Code scanner for the security guards and other relevant personnel. The improvement of the Health Declaration Form is also encouraged, such as adding contact tracing in the form to break transmission chains by quickly identifying, isolating, and treating cases and providing supportive quarantine for contacts. An upgrade of the Health declaration is also



recommended by having the inputted data automatically disappear after fifteen (15) days. Next, creating an Identification Card design with the Quick Response Code is also suggested. Furthermore, the researchers recommend that future researchers examine and further analyze facts about the study, which can be utilized as a potential reference for research concerning the usage of Quick Response Codes on Identification Cards.

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