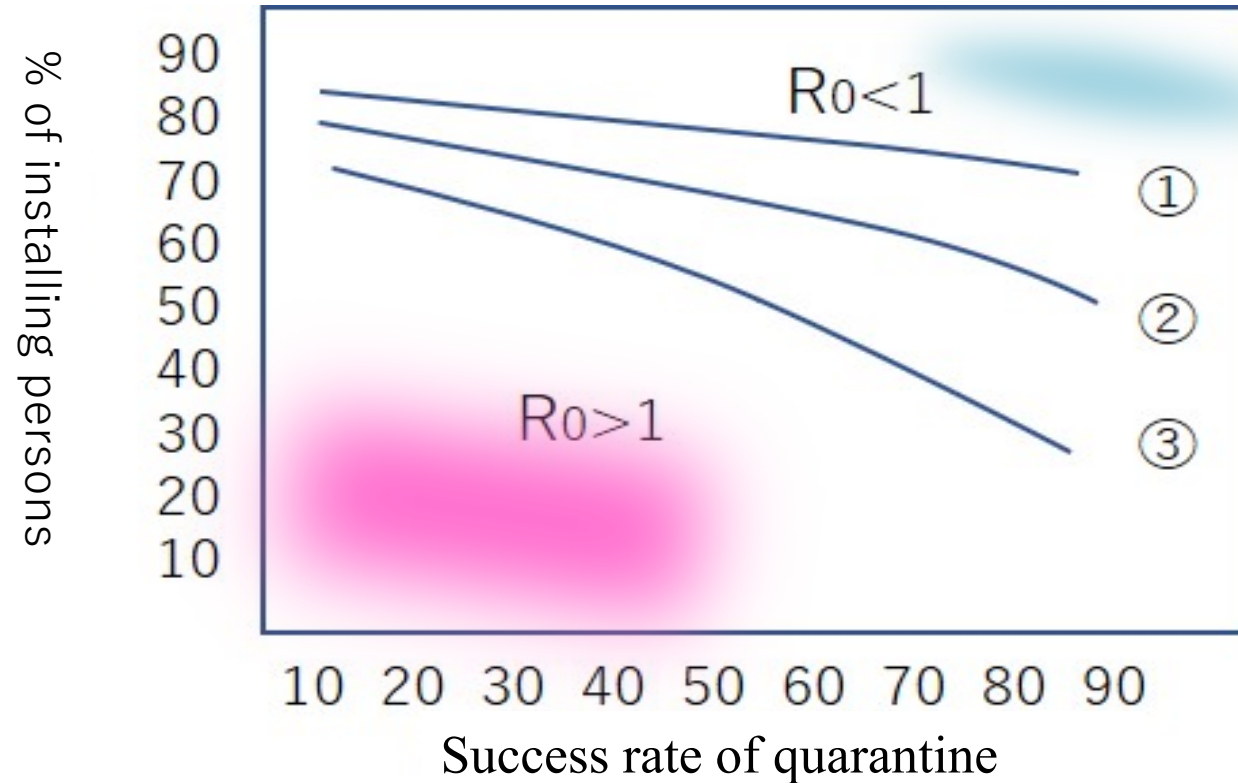


Twist of Contact Notification App for COVID-19

Hiroshi Nakagawa
RIKEN · AIP

Purpose of contact tracing app

- Purpose of the contact notification app = Notifies you that you have contacted an infected person
- If you are notified, you take PCR test, and if positive, you should be quarantined. This prevents your infection spread to others
- For this purpose, many people need to install it on their smartphones to prevent the spread of infection
- Is it possible to reduce the number of effective reproductions by using the contact notification app?



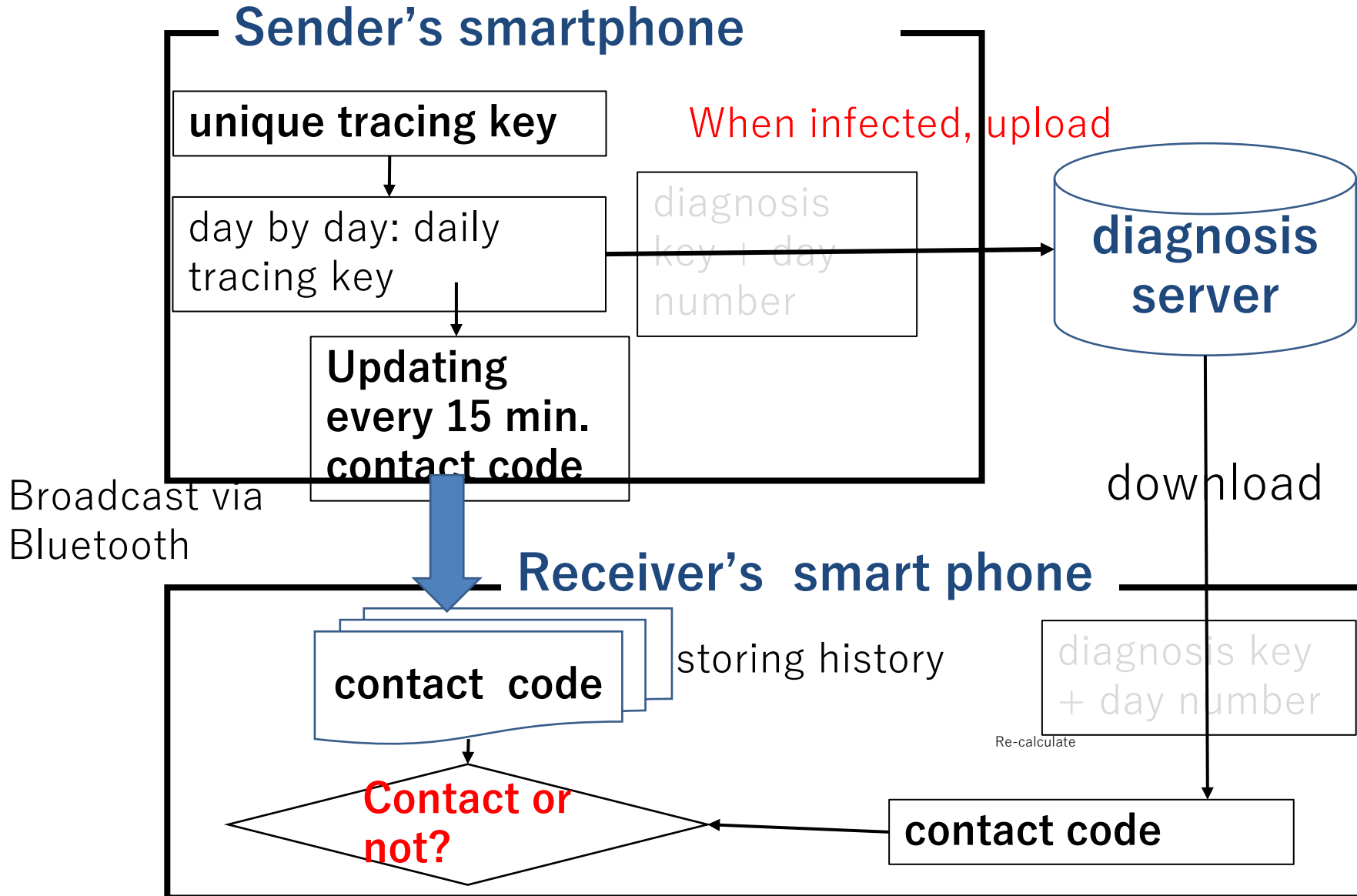
Ferretti, Luca, Chris Wymant, Michelle Kendall, Lele Zhao, Anel Nurtay, Lucie, Abeler-Dörner, Michael Parker, David Bonsall, and Christophe Fraser. 2020. "Quantifying SARS-CoV-2 Transmission Suggests Epidemic Control with Digital Contact Tracing." *Science*, March. <https://doi.org/10.1126/science.abb6936>.

- ① It takes 2 days to quarantine a person who has been notified of the infection and tested and found to be infected.
- ② Same as above The number of days until quarantine is one day
- ③ Same as above isolation on the same day
- ◆ $R_0 < 1$ in the upper region of the curve and $R_0 > 1$ in the lower region.

Situation of EU

- Initial: Centralized system PEPP-PT
 - Participants of this app send the ID to the central server to database, and participants who were closer are also registered
 - When an infected person registers his / her ID, he / she notifies nearby participants of contact.
- Next: Personal ID distributed system D3PT
 - Send the hash value frequently updated on your smartphone as a personal ID to the central server (enhanced privacy protection) → imported to G&A
- Google & Apple are APIs that run on Android devices and iPhones with more thorough privacy protection
- (hereinafter referred to as G & A)
 - It is used in many European countries.

Google & Apple APP



Situation in China

- China Health Code: Contact tracking using GPS information by health code
- China's health code is mandatory
- In China, the "self" is part of the community, culture and society and is compulsory.
 - Those who do not want to participate are considered to be a potential risk to the safety of those around them.

Situation in China

- There seems to be some disagreement with the unlimited expansion of the system by health code.
 - Hangzhou Ministry of Health tried to use the health code system for other purposes.
 - Many disagree the proposal to expand the use of the health code after the outbreak of the pandemic.
 - The extent to which privacy is protected under a centralized system is completely unclear from other countries.
- Without a health code and smartphone, you can't use transportation or do shopping at the market.
- There is no privacy in a society where you can survive without a smartphone. That means that you can not survive only using cash that allows anonymous behavior

Situation in Korea

- South Korea has already established a legal framework for contact tracking in 2015 for Middle East Respiratory Syndrome (MERS)
- Mandatory installation of a mobile app called "Self-Quarantine Security App"
 - The government can track infected persons using the GPS data of the quarantined person's smart device in real time and find whether they stay in the quarantine.

Situation in Korea

- Personal information protection laws and other data protection laws were major obstacles to introduce a centralized tracking approach using networks.
- But, experience of MERS persuaded people that their personal data are used for preventing pandemic.
- The “COVID-19 Epidemiological Investigation Support System” launched on March 26, 2020. That will provide infectious person information to epidemiological investigators in real time.

Situation in Korea

- The centralized type was introduced because there is public credibility for the very strict data protection laws in South Korea.
 - Significant revision of privacy and data protection legislation in February 2020 to prevent COVID-19 pandemic.
- The Personal Information Protection Commission plays a more active role in balancing between the rights of data subjects and preventing covid-19 spread.

Situation in Singapore: TraceTogether

- TraceTogether is a mobile app that supports contact tracking.
- Its use is voluntary, but foreign workers living and working in high-risk areas need to download and activate the latest version of the app.
- If two TraceTogether terminals are within the BLE range, they will detect each other and the record of the detection result is saved in the user's mobile phone terminal.

Situation in Singapore :QR code

- In Singapore, a system that informs the server of your location by a QR code attached to each location is also in operation.
- It is also required when using the subway.
- Data accumulated through a secure admission app with a QR code is centrally stored by the government.
- Guaranteed to be discarded after the end of the potential incubation period (14 days)

Situation in Singapore

- Authorities enforce complete quarantine for foreign workers
- Behind this, was there the intention to prevent the spread to the general public.
- This intention is realistic but can be considered unfair to foreign workers.

Background to ordering the contact notification app in Japan

- From February 2020, research and development of contact notification apps started in various places such as Code for Japan and OSS.
- A first, the government seems to have considered the coexistence of multiple contact notification apps.
- However, G&A notices us that only one system per country is allowed for contact notification apps that use G & A API.
- Under the limiting government procurement, the Japanese government was forced to choose between 1) G & A or 2) coexisting multiple systems without adopting G & A.

Background to ordering the contact notification app in Japan

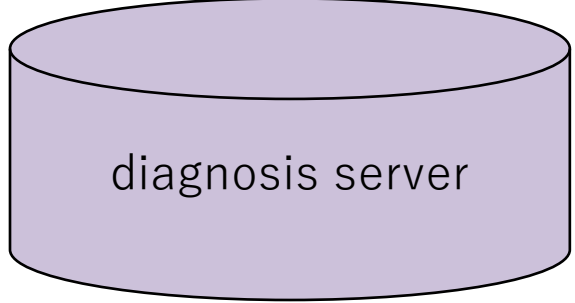
- In Japan, about half of smartphone users are iPhones
- → Government procurement is integrated into G & A
- They named it COCOA (COVID-19 Contact --Confirming Application).
- This decision of adopting G&A seemed reasonable with the high % of iPhone user's in Japan from the perspective of the app penetration rate of 60%.

Background to ordering the contact notification app in Japan

- However, this contact notification app is no longer the original purpose of early detection of potential infectious individuals and quarantine because the capacity shortage of PCR test nation wide.
- Rather the purpose became to promote behavior change of "not infecting / not being infected" by notification.
- ◆ Therefore, the reason for deciding to attract iPhone users with a penetration rate of 60% is weak.
- ~~Code for Japan~~, OSS
 - OSS cannot be directly subject to government orders
- A major software company was received an order from the government.
- OSS members belonged this major software company.

HER-SYS is required to prevent false registration, but ...

Delete after 14 days



5. Diagnosis server sends contact information to every smart phone.

2. He notices that he get infected and sends the processing number.

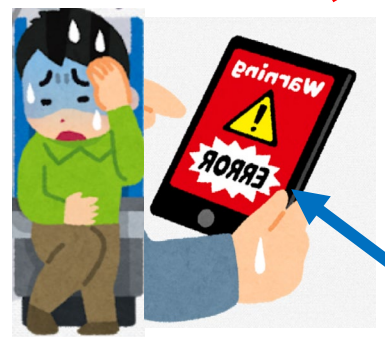
3. Ask whether processing number is really stored on HER-SYS

4 The confirmation result of the processing number

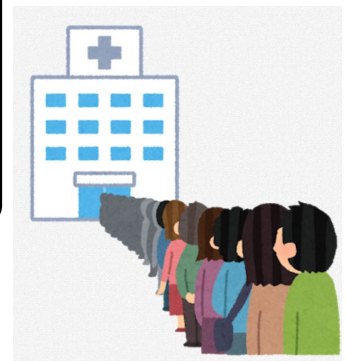
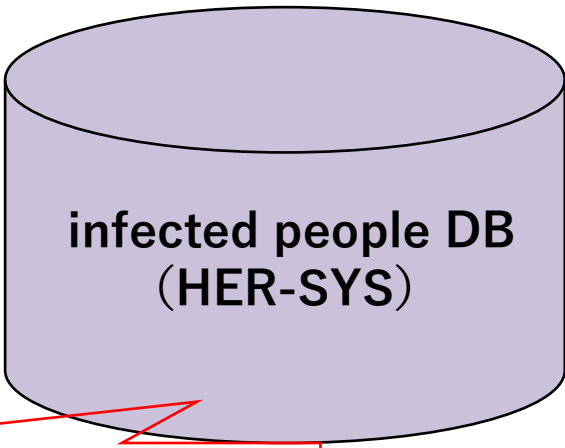


6. She tries to get PCR test whether infected or not.

PCR Infection found



1. Get processing number



The problems is that HER-SYS is not properly managed in the beginning

Specifications and problems of the contact notification application COCOA

- Parsol Process & Technology developed HER-SYS.
- → Parsol Process & Technology takes over COCOA developed by OSS
- → Development system is difficult to understand from the outside
- COCOA will be released on June 19, 2020
- Many bugs occurred. Those bugs are presumed to be caused by the combination with HER-SYS
- Suspension and resumption of use occurred repeatedly.

Specifications and problems of the contact notification application COCOA

- The development period was very short, about one month.
- Individual developers seem to have made the great effort, but....

- The link with HER-SYS makes the system complicated.
- It seems to be very bad that the system has been developed by different organizations.

- Opinion of the Council of Experts on the Specifications says: We should care handling personal information regarding the diagnostic key linked to HER-SYS.

Specifications and problems of the contact notification application COCOA

- HER-SYS and COCOA need safety management measures to thoroughly prevent leakage of personal information
- However, although HER-SYS is under the control of the Ministry of Health, Labor and Welfare, it is unclear whether it is able to properly fulfill its responsibilities as a data administrator of the personal information database.
- Since HER-SYS is a complicated system, it must be set by a data administrator who has the skills to understand its contents and data collection method, but the Ministry of Health, Labor and Welfare seemed not having the skills.

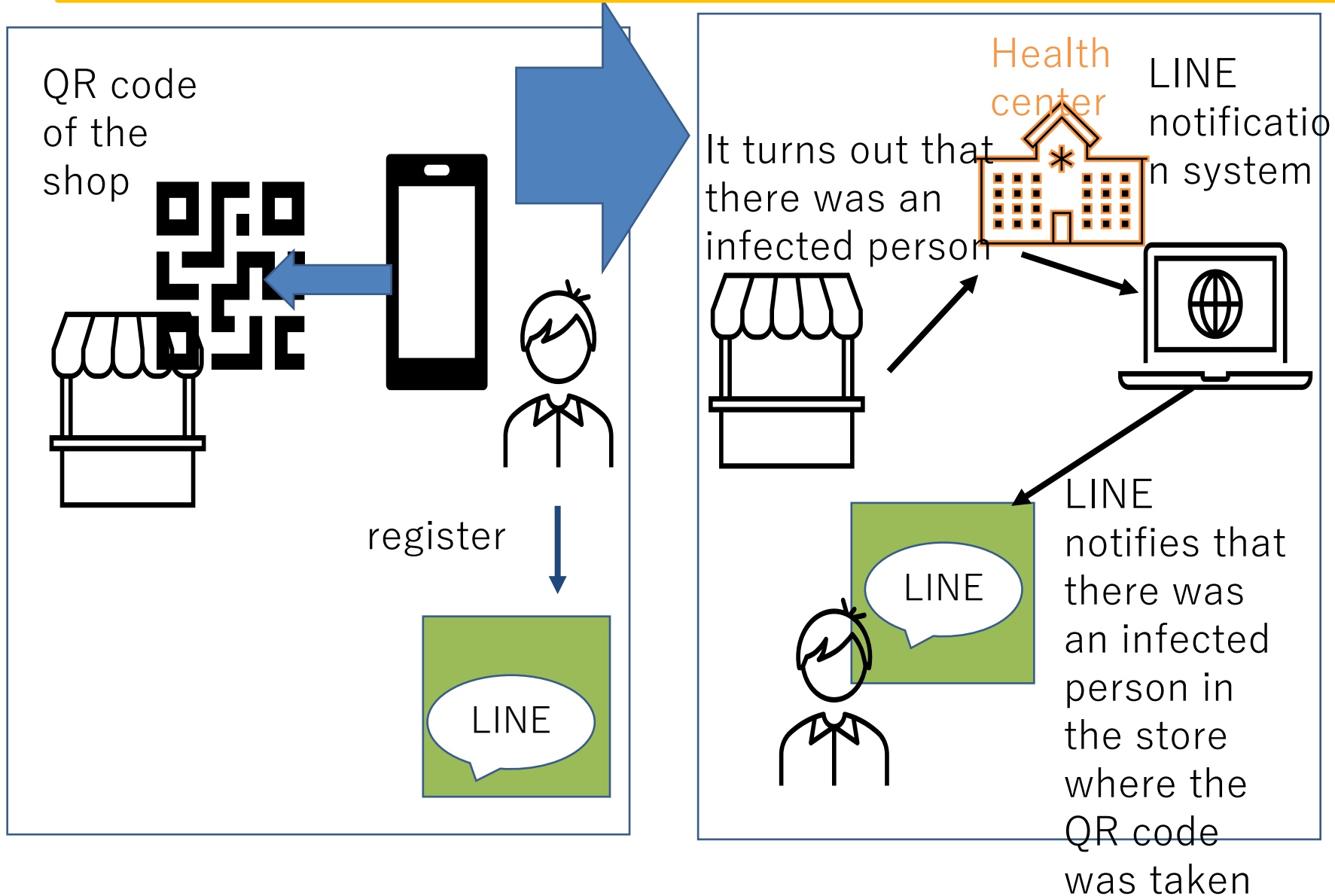
Specifications and problems of the contact notification application COCOA

- This unfavorable situation was finally improved by the Ministry of Health, Labor and Welfare on September 10, 2020, as reported in the article by Nikkei XTECH.
- According to the article
- (1) A lot of unnecessary information input is required,
- (2) The problem was that HER-SYS did not have a function to extract access logs, and unauthorized access to the database HER-SYS, which stores sensitive personal information, could not be monitored from the health center of the local government.
- Initially the HER-SYS issue was ignored, but ...
- Minato Public Health Center in Minato Ward in Tokyo requested the revision and finally the above problems (1) and (2) were resolved.

Current situation in COCOA

- Less than 20% of people subscribed COCOA.
- % of registration from infected people is very small, less than 10%
- As the result, we contacted nearly hundreds times as many infected people as the number of contact notifications received at COCOA.
- In addition, COCOA have not worked on Android terminals during these four months because developers have not caught up with OS updating time to time.

Another system: Event QR code + LINE notification



Summary

- COCOA has an excellent technologies.
- But, its design is worried too much about privacy protection.
- If we use more personal info. such as GPS location data, more effective system to trace infected persons.
- **Tech + Legal + Ethics + Public mentality**