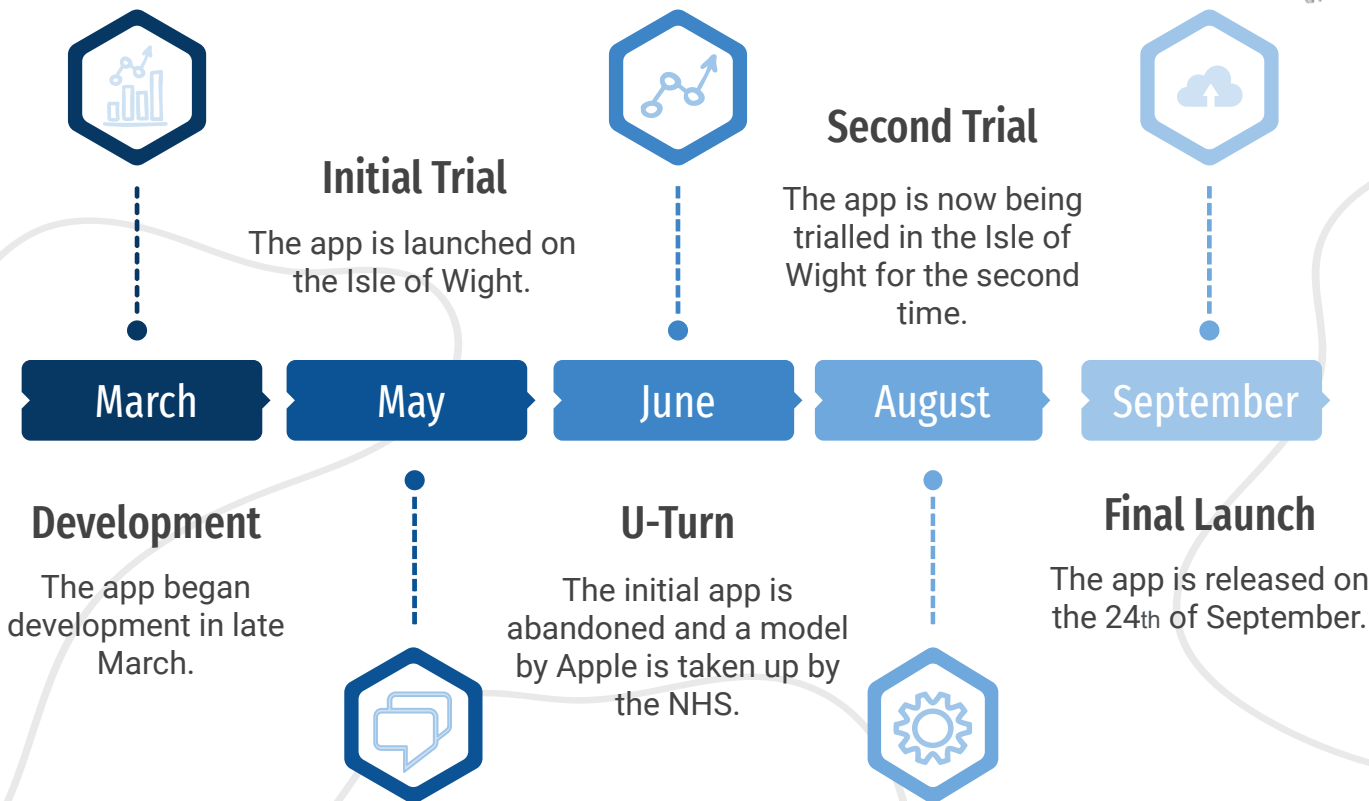# U.K. vs. Hong Kong
Contact Tracing Apps

By: Igla, Febin, Joseph, Robert and Shruti

Overview

1. Timeline of Development
2. Stakeholder Analysis
3. Usability Assessment
4. Data Model & Design Diagram
5. Functional & Non-Functional Requirements
6. Strengths & Opportunity
7. Weaknesses & Threats
8. Technological, Ethical and Logical Issues

Timeline of Development - The UK

Development

The app began development in late March.

Initial Trial

The app is launched on the Isle of Wight.

U-Turn

The initial app is abandoned and a model by Apple is taken up by the NHS.

Second Trial

The app is now being trialled in the Isle of Wight for the second time.

Final Launch

The app is released on the 24th of September.

| March | May | June | August | September |

Timeline of Development - Hong Kong

Initial Release

19 March 2020 a version of the wristband was given out but it didn't have a tracking ability and relied on scanning the QR codes repeatedly.

Second Release

2 more hotlines were set up and those that could not activate the app were contacted via SMS later and sorted out.

Before March	March	March	March	October

Development

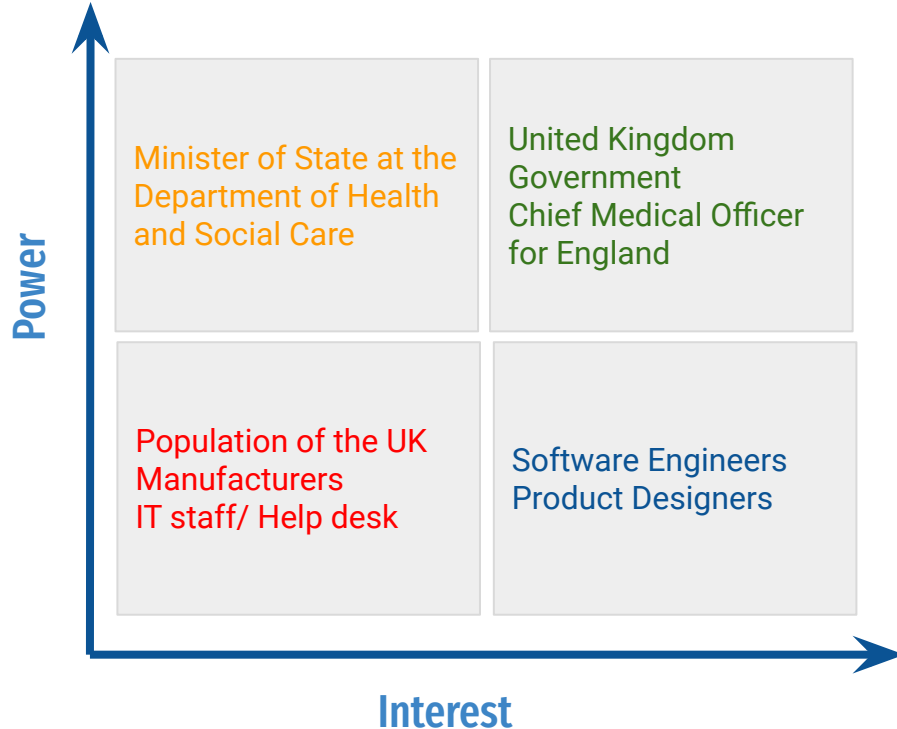Development of the app began sometime earlier that year.

Problems

People were complaining that earlier wristbands couldn't activate the mobile app and it was hard to download the app without the Google Play store.

Current Situation

Currently the app is working as intended and is being used to enforce people to isolate to limit the spread of coronavirus.

Stakeholder Analysis 🇬🇧

Power (vertical axis)
Interest (horizontal axis)

- Minister of State at the Department of Health and Social Care
- United Kingdom Government Chief Medical Officer for England
- Population of the UK Manufacturers IT staff/ Help desk
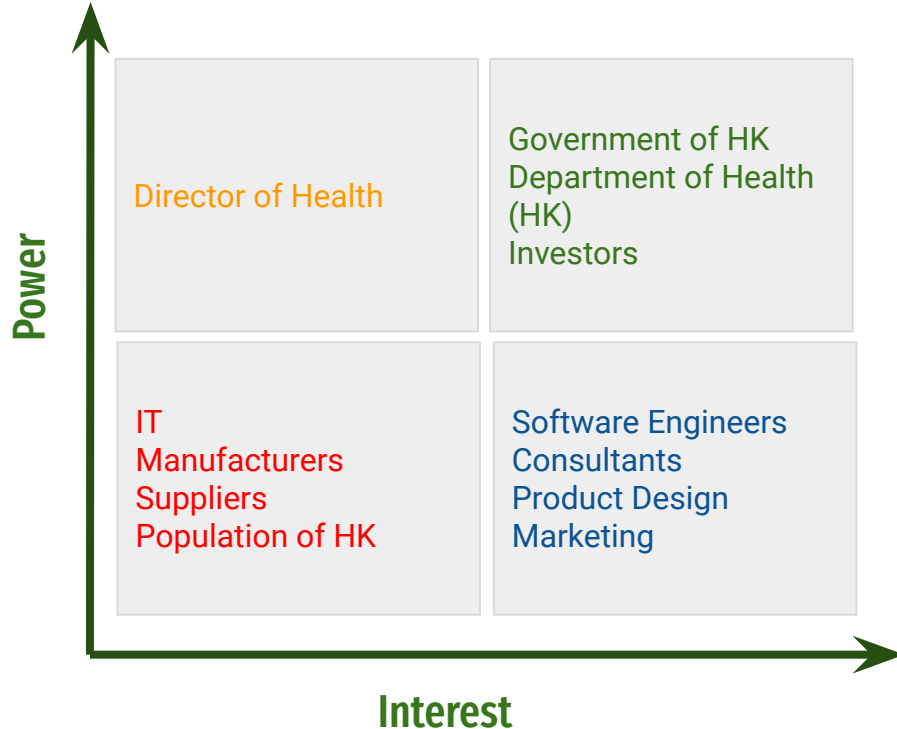- Software Engineers Product Designers

High Power | Low Interest - have control of the project but do not know the specifics.

Low Power | Low Interest - are essential in the manufacturing and use of the application.

Low Power | High Interest - are essential in the ideation, implementation and execution of the project.

High Power | High Interest - manage the project closely to ensure control on quarantined individuals.

Stakeholder Analysis

Director of Health	Government of HK Department of Health (HK) Investors
IT Manufacturers Suppliers Population of HK	Software Engineers Consultants Product Design Marketing

Power (vertical axis)
Interest (horizontal axis)

High Power | Low Interest - have control of the project but do not know the specifics.

Low Power | Low Interest - are essential in the manufacturing and use of the application.

Low Power | High Interest - are essential in the ideation, implementation and execution of the project.

High Power | High Interest - manage the project closely to ensure control on quarantined individuals.

Usability Assessment 🇬🇧

Design ————● Simple design, not very complicated

Functionality ————● Scanning QR code at a venue is very simple and quick

Ease Of Use ————● Quite easy to use
Can navigate using speech recognition software

REVIEWS   ⓘ Review Policy

4.1
★ ★ ★ ★ ☆
👤 86,827 total

5	████████████████
4	█████
3	███
2	██
1	████

Usability Assessment 🇭🇰

Design ────● Simple and intuitive use of buttons and menus and available in 2 main languages (Mandarin and English)

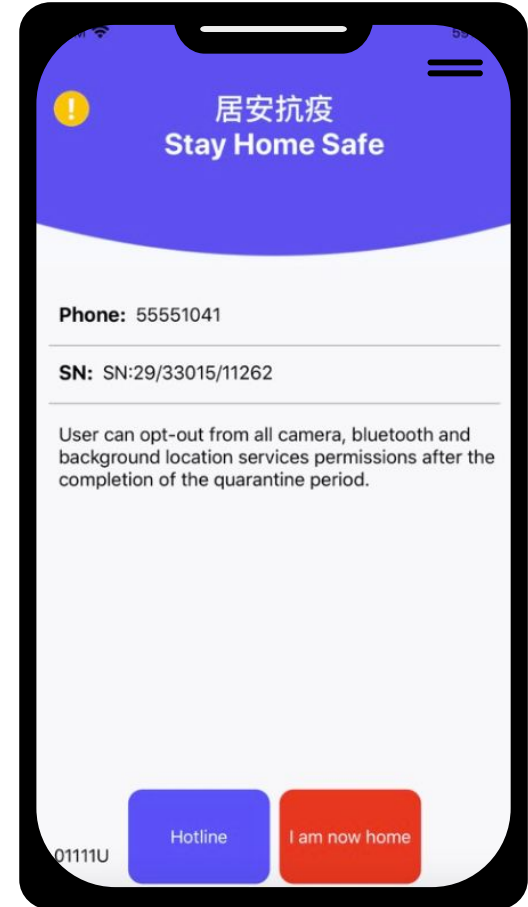**Functionality** ────● Many reported bugs with notifications and scanning QR codes

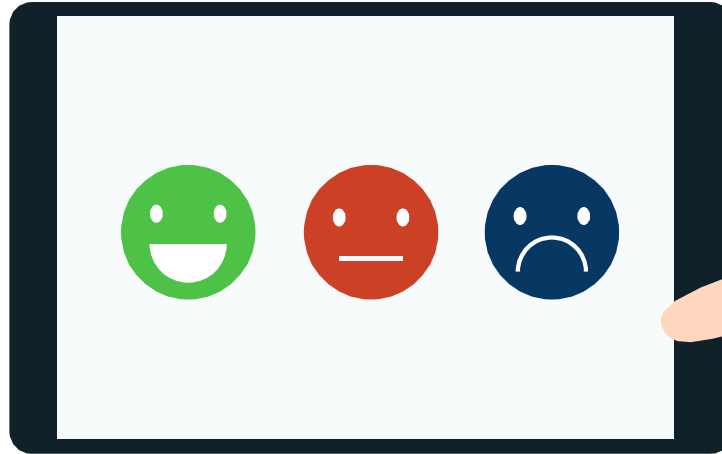**Ease Of Use** ────● Many users have problems with app crashing etc.

REVIEWS

Review Policy

2.3

★ ★ ☆ ☆ ☆

👤 398 total

5
4
3
2
1

居安抗疫
Stay Home Safe

Phone: 55551041

SN: SN:29/33015/11262

User can opt-out from all camera, bluetooth and background location services permissions after the completion of the quarantine period.

01111U

Hotline

I am now home

Usability Assessment 🇭🇰

Good

- Hotline Support
- Small App Size
- Straightforward Registration

Could Be Better

- Fairly Intuitive
- Takes a while to scan QR codes

Bad

- Low quality support (Auto-responses)
- Reported bugs (Notifications)

Data Model 🇬🇧

- Centrally, the NHS Covid-19 app stores your postcode district, a history of places you have checked into the past 2 weeks and the result of your last Covid-19 test with the dates symptoms started.
- Locally, QR code data is stored for 21 days along your postcode district. Users can choose to delete this if they want and this information is anonymised.
- A code is generated every 15 minutes, which is stored on other users' phones if you come in close proximity with each other. Their code will be stored on your device. These stay 2 weeks before deletion.
- If you test positive, your daily codes will be moved to central storage to be send out to all users to be checked against the codes on their device, so they get notified of exposure to the virus.
- The central system doesn't store any data on who you have been in contact with, it is all done locally on all users' phones.
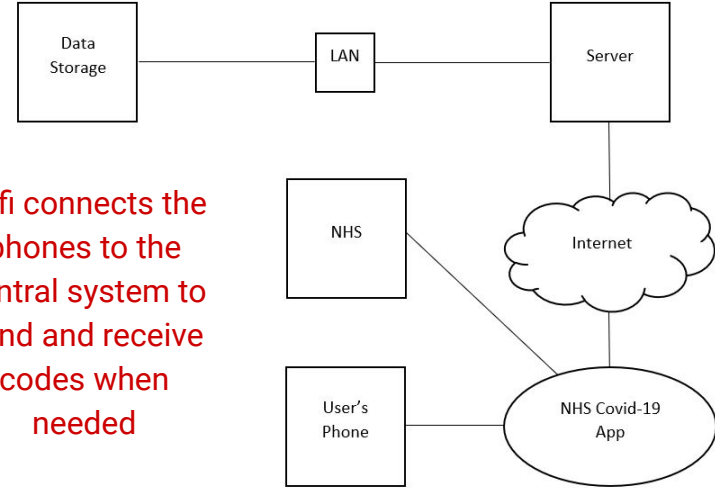
Data Model 🇭🇰

- The "StayHomeSafe" app requires users to wear a wristband which collects geolocational data using GPS and stores it in the app.
- The app also scans for and stores results of people's covid tests in the surrounding areas using Wifi and Bluetooth.
- The app makes the user walk around their home and creates an physical parameter that they are not allowed to leave, meaning it stores information on the dimensions of the users' houses.
- If the user has more than one member within their household, they have to scan their family members wristbands and the app collects information from their wristbands too.
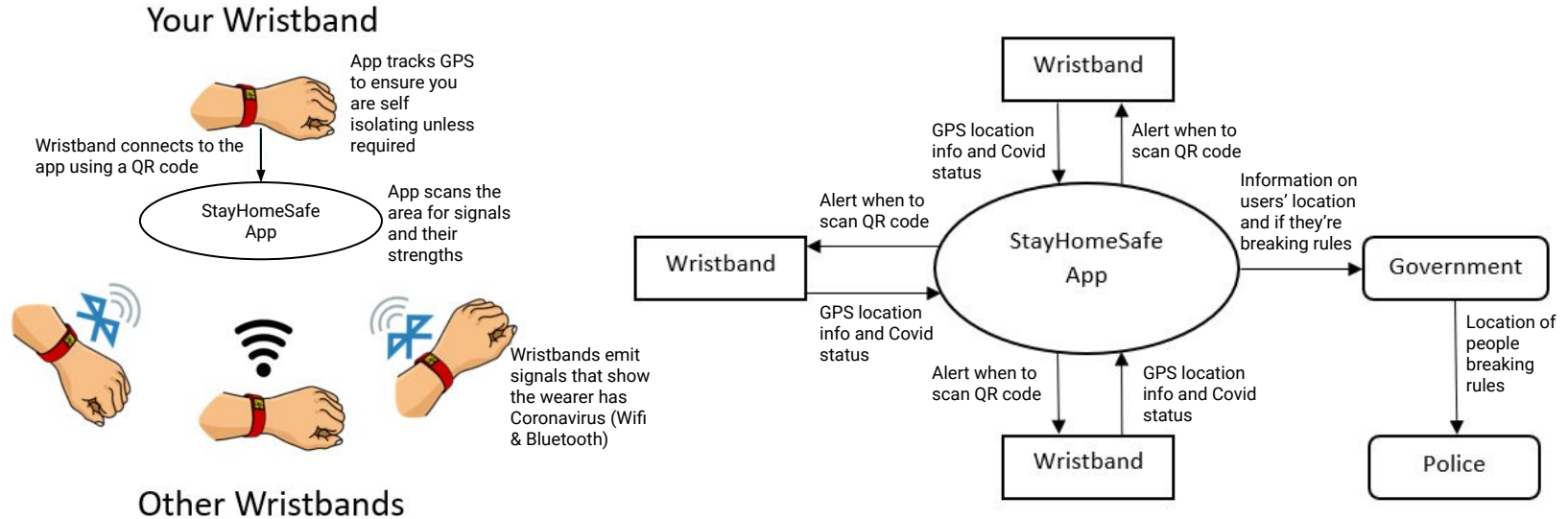
Logical Design Diagram & Technical Architecture 🇬🇧

Phones use bluetooth to detect whether they are in close proximity with each other.

If they are, they will store a unique code on each other's phone to say they've been in close contact.

Wifi connects the phones to the central system to send and receive codes when needed

Data Storage — LAN — Server
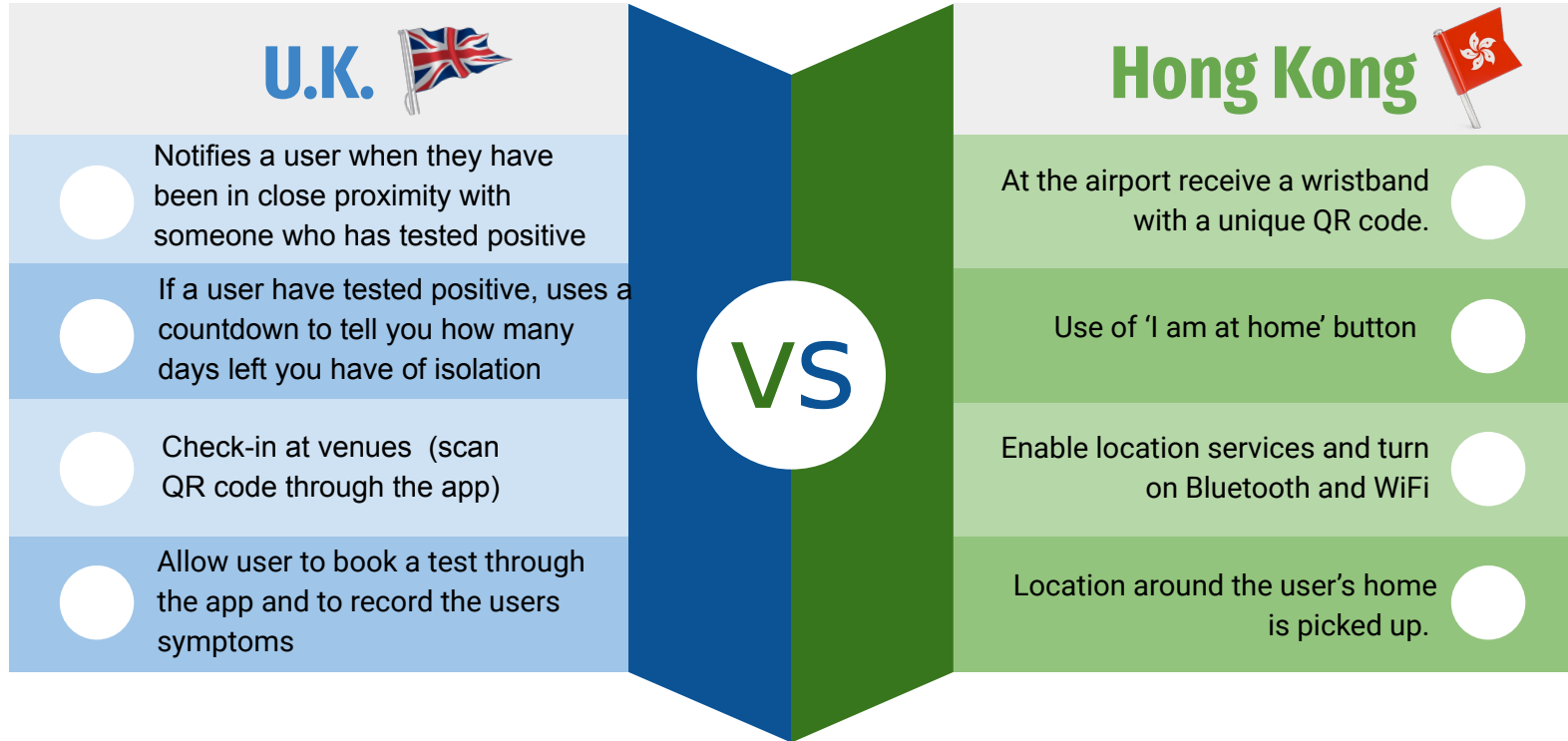
NHS

Internet

User's Phone

NHS Covid-19 App

- The NHS can contact the user through the NHS Covid-19, regarding exposure.
- Users that test positive will usually receive their result through text and/or email.
- When required, the app will take codes off of the user's phone and upload them to the central system (with permission), then will download these onto every user's phone for comparison, to check if they have been exposed to the virus.
- If they have been, they receive a notification and are required to isolate and take a test.

Logical Design Diagram & Technical Architecture 🇭🇰

Your Wristband

App tracks GPS to ensure you are self isolating unless required

Wristband connects to the app using a QR code

StayHomeSafe App

App scans the area for signals and their strengths

Wristbands emit signals that show the wearer has Coronavirus (Wifi & Bluetooth)

Other Wristbands

Wristband

GPS location info and Covid status

Alert when to scan QR code

Information on users' location and if they're breaking rules

Alert when to scan QR code

Wristband

StayHomeSafe App

Government

GPS location info and Covid status

Alert when to scan QR code

GPS location info and Covid status

Location of people breaking rules

Wristband

Police

- You have to put on a wristband and install the "StayHomeSafe" app.
- The app will detect and analyse the environmental communication signals, such as Bluetooth, Wi-Fi and geospatial signals
- If a change of such signals is detected, the app will record it.
- If you have left your house without permission, the Government will take further actions, such as conducting spot checks, making a prosecution or issuing a wanted warrant.

Functional Requirements

U.K. 🇬🇧

- Notifies a user when they have been in close proximity with someone who has tested positive
- If a user have tested positive, uses a countdown to tell you how many days left you have of isolation
- Check-in at venues (scan QR code through the app)
- Allow user to book a test through the app and to record the users symptoms

VS

Hong Kong 🇭🇰

- At the airport receive a wristband with a unique QR code.
- Use of 'I am at home' button
- Enable location services and turn on Bluetooth and WiFi
- Location around the user's home is picked up.

Non-Functional Requirements

U.K.

- Make sure the time frame the user is notified to let them know they have been in close proximity with someone who has tested positive is reasonable.

- Make sure data user puts into the app is secure and only used for coronavirus prevention purposes.

VS

Hong Kong

- Use of Geo Fingerprinting for validation.

- Use of Geofencing to ensure privacy.

- Data store within the government.

- TLS 1.2, JSON Web Token, SonarQube and more used.

Strength

Users can choose what data they would like to put into the app.

Location check-in notified if someone who was at the same venue as you at the same time has tested positive

Shows risk of catching virus in your area

Opportunity

People will feel more safe using the app resulting in more people downloading and using the app.

Could prevent further people catching virus.

People in higher risk areas are more likely to take extra precaution, preventing further spread of virus

Strength

Opportunity

The "StayHomeSafe" app is connected to a wristband that has a QR code on it. Passengers who have landed in Hong Kong are required to wear them.

The app comes is a multitude of languages and no country code is required when you enter your phone number.

You cannot just cut off the wristband as it will also alert the authorities.

If the users have any problems they have a multitude of contact methods.

The QR code is very handy as it allows you to add yourself and others you are isolating with to the app and by connecting with the wristband it can be used to detect if you have left your house.

居安抗疫
Stay Home Safe

Phone: 55551041

SN: SN:29/33015/11262

User can opt-out from all camera, bluetooth and background location services permissions after the completion of the quarantine period.

01111U

Hotline

I am now home

Weaknesses & Threats

U.K. 🇬🇧

W — App can only work while bluetooth is turned on

T — This is battery draining; there are many security issues this could cause many people to be sceptical or not download the app at all

W — For the app to succeed the vast majority of the population must download it

T — Some people may not download it due to laziness or due to security issues; some people are unable to download it as the app cannot be downloaded on phones that aren't smartphones.

W — People may not show symptoms

T — People won't contribute anything towards the app if they don't show symptoms as they won't realise whether they have the virus or not (unless someone they have been incontact with has tested positive)

VS

Hong Kong 🇭🇰

W — There is a possibility that the wristband could be damaged by accident and then it would render the QR code useless as it cant be read.

W — There are instances where some people are not comfortable with wearing the wristbands because they believe that it is an infringement on their rights.

T — The app could be used to collect people's personal information from their phones.

T — The app could be used to trace peoples habits and their daily routines.

T — The app allows the government to intrude into people's personal lives for a whole 2 weeks and monitor them constantly infringing on their rights of privacy.

T — The app allows the government to intrude into people's personal lives for a whole 2 weeks.

Security Threat Analysis

U.K

1 HMAC doesn't seem to be encrypted beyond broadcast value encryption which can allow a number of attacks to be performed by anyone able to observe submissions of installation IDs

2 Pairwise matching of Timing data, RSSI values will facilitate recovery of installation IDs between pairing and uploaded dataset leaving lifestyle attributes (w/out access to Authority Private Key)

3 Long lived broadcast values: Currently broadcasts the same encrypted ID for 24 hours specified privacy protection can reveal additional lifestyle attributes about user who submits data

4 Bluetooth has to be enabled all the time — privacy risk leaves data vulnerable to interception

Hong Kong

1 The app will store people's personal information. It will store their phone number, email address and any details of people who live alongside them etc

2 It also monitors their daily routine during the 2 weeks of isolation as the app makes you walk all around your house in the beginning identifying different rooms.

3 It uses GPS, Bluetooth and WiFi to locate where the person is at all times to make sure that they are isolating.

4 People's personal information is available and that could be used for illegal activities. Could be misused by governments.
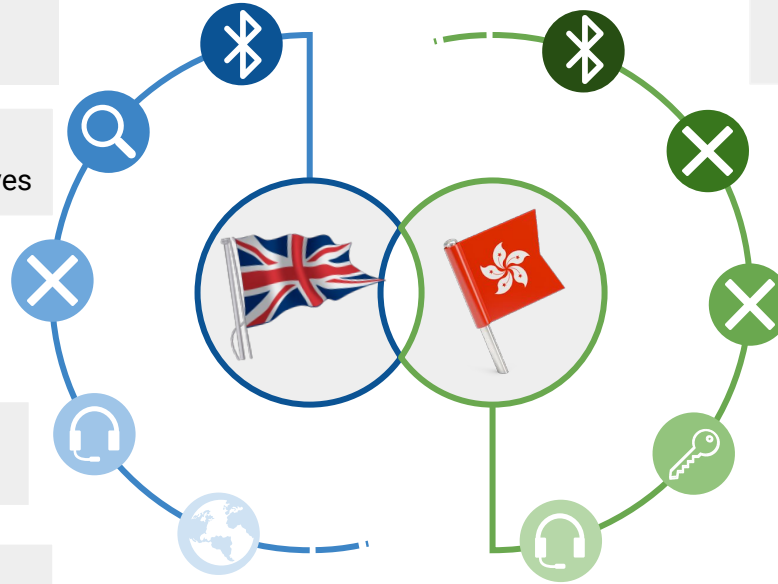
Technological Issues

Bluetooth Based Risks:

Risk of overreporting interacting, leading to number of false positives

Security is at risk, hackers can spread malicious files & viruses

Cannot be downloaded on smart phones older than 2 years old

Not the entire population has smartphones newer than 2 years old or smartphones at all

Weak Bluetooth Connections:

Causes unnecessary verification requests

Causes frequent rescanning of the wristband

Requires an password sent by SMS to launch the application.

Default verification notification is a vibration

Ethical and Legal Issues

| U.K. | VS | Hong Kong |

- Implementation of the App can be compared to a population wide experiment & since it's unprecedented & there isn't much time for it to be tested etc. before it's put out to the public
- For the vast majority of the population to download the app & for it to not only be unsuccessful but to also put their privacy at risk would be unethical
- No legal requirement at the end of the crisis data collected by app is securely deleted & not just anonymised
- Data collection in app should only be used for coronavirus prevention

- Only a third of the wristbands handed at airports had been activated by passengers.
- For Contact Tracing to work efficiently it requires efforts from both the government and the citizens.
- Many people had been seen around with their wristbands, meaning they hadn't followed the 14 day quarantine.
- Any data provided to the app will only be disclosed with the Government of Hong Kong and Department of Health.
- The government does not track the exact location of the quarantined individual.
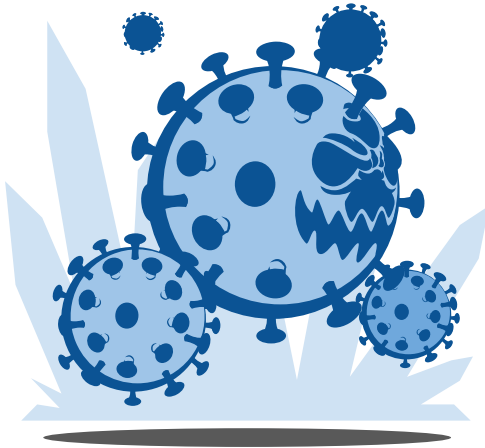
Which App is the Winner?

NHS COVID 19

StayHomeSafe

VS

In terms of design the UK app seems to be more advantageous than the "StayHomeSafe" app, it is more user friendly and there haven't been many reports of the app glitching.

Guardian stated that only 50% of the UK would download the app and 60% would need to download it for it to be successful.

Since the "StayHomeSafe" app is compulsory for those who have tested positive, more people are using the app which means it has a higher chance of success than the UK app which is not compulsory.

If broken there is a threat of 6 months jail with a $3,200 fine and this forces people to cooperate.

Coronavirus cases in the UK 🇬🇧

The implementation of the COVID app in the UK had no influence over the number of cases, in fact the cases have risen more since then.

Coronavirus cases in Hong Kong 🇭🇰
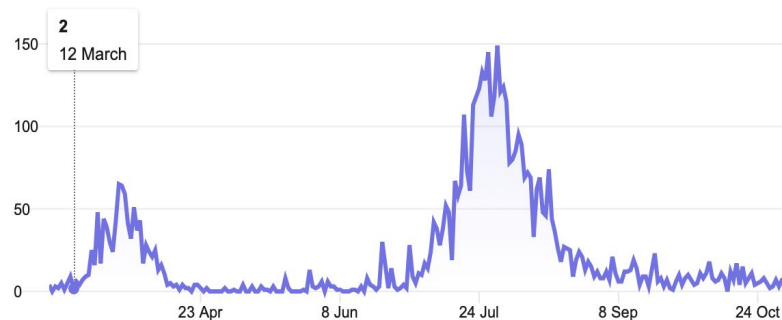
After the implementation of the "StayHomeSafe" app in Hong Kong the number of cases per day went down.

However cases started to rise again in July, in which the government reacted by warning citizens that breach the rules with a fine and a prison sentence causing numbers to lower.
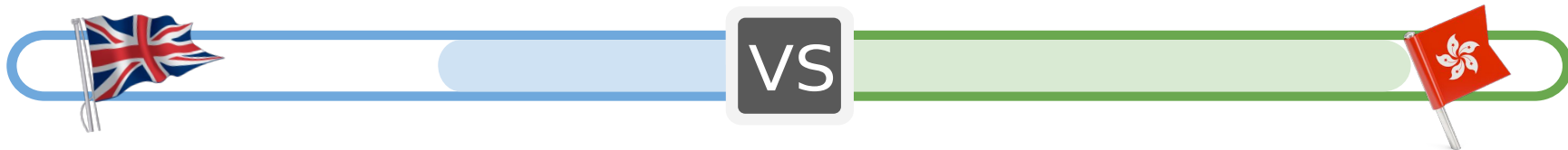
The most successful app is...

🇭🇰 **The StayHomeSafe app** 🇭🇰

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Screenshot of homepage from StayHomeSafe application.

Screenshot of homepage from NHS COVID-19 application.

Screenshot of Coronavirus case statistics of Hong Kong and U.K. from Google.

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