



EVALUATION OF COVID-19 CONTACT TRACING APPLICATION OF INDIA – “AAROGYA SETU” USING SYSTEM USABILITY SCALE.

Public Health

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ABSTRACT

Health is multi-dimensional, determined by physical, mental, environmental, social, political, cultural factors, etc., influenced by various emerging and ongoing viral infections and diseases. COVID-19 is the name of existing novel viral pneumonia which is coined by WHO in 2020 whereas the International Committee on Taxonomy of Viruses suggested this as “Severe Acute Respiratory Coronavirus-2” based on phylogenetic and taxonomic analysis of pandemic novel coronavirus. Due to its fatal clinical symptoms, WHO has declared it a pandemic outbreak. To combat this, “AAROGYA SETU”, a contact tracing app, developed and approved by the Indian government and National Informatics Centre, warns the users if they have crossed paths with any infected person recently. The critical review of this application helps to evaluate its potency in terms of its usability, learnability, and acceptability amongst the users using a system usability scoring system (SUS). This paper shows how such applications can be tested using SUS based out of technical glitches, client's understanding and acceptability to their social expectations, in proactively reaching out to and informing the users of the app regarding risks, best practices, and relevant advisories pertaining to the containment of COVID-19.

KEYWORDS

Pandemic, India, Coronavirus, COVID-19, Aarogya Setu, SUS

INTRODUCTION:

Health and Coronavirus:

Health is multi-dimensional, determined by physical, mental, environmental, social, political, cultural factors, nutrition, etc. Health is influenced by various emerging and ongoing viral infections and diseases. According to the published pandemics report by World Health Organisation (WHO) [1] viral outbreaks like Ebola, Lassa fever, Marburg virus, Crimean Congo hemorrhagic fever, Nipah, Zika virus, Rift Valley fever virus, SARS-CoV, MERS-CoV and COVID-19 are some of the scientifically evident outbreaks which had highly influenced our life. The need for public health emergencies showed a way of handling the pandemics and its impacts on overall health. WHO has declared recent pandemic alert of COVID-19 globally in December 2019.

“Corona Virus Disease (COVID-19)” is the name of existing novel viral pneumonia which is coined by WHO in 2020 whereas the international committee on Taxonomy of Viruses (ICTV) suggested this novel coronavirus as “Severe Acute Respiratory Coronavirus-2 (SARS CoV-2)” based on phylogenetic and taxonomic analysis of pandemic novel coronavirus [2]. This virus belongs to the family of Coronaviridae, of the order Nidovirales, comprising large, single, plus-stranded RNA as their genome [3,4]. Currently, there are four genera known for coronaviruses i.e. α -CoV, β -CoV, γ -CoV and δ -CoV [5,6]. Most of the coronavirus is capable to cause the infectious diseases in human and vertebrates where two of them, α -CoV and β -CoV, mainly infect the respiratory, gastrointestinal and central nervous system of humans and mammals, while γ -CoV and δ -CoV mainly infect the birds [3,7-9].

Novel Coronavirus disease (COVID-19) is an infectious viral disease caused by a newly discovered virus genera where most of the people infected with and experience mild to moderate respiratory illness with hyperthermia, dry cough, sore throat, increased work of breathing and muscle pain, confusion, skin rashes, loss of taste or smell, etc.[10] It affects mostly the vulnerable population including older people with compromised immunity, pregnant women, etc. It is transmitted through droplets of saliva or discharge from the nose when infected individual sneezes or coughs. Although at point of time, there is no specific vaccination available to cure this disease but many ongoing clinical trials evaluating its potential treatment. However, its transmission can be controlled by protecting yourself and others from infection by washing your hands, using alcohol-based hand rub, wearing gloves, avoid touching your face, eyes or mouth and most importantly, maintaining a social-physical distancing. [11]

The pandemic outbreak of Novel Coronavirus (COVID-19) has become a major public health burden globally. On January 30, 2020, India reported its first case in its God's own country, Kerala state,

which rose to three cases within 3 days confirmed in students who had recently returned from Wuhan, China. On 4 March, 22 new cases came to light, including those of an Italian tourist group with 14 infected members and as time passes, positivity rises exponentially from 1 to 544846 (total cases) by June 30th with accounting total mortality due to COVID-19 of 16893 in the entire country (Figure1) [12,13].

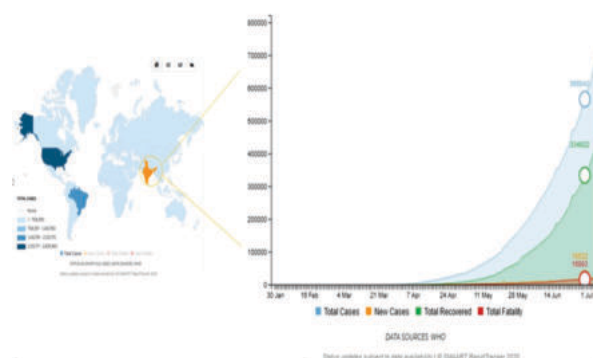


Figure 1: Total confirmed cases of COVID-19 in India

The transmission increased during March, were linked to people with a travel history to affected countries were reported. Looking into the situation, COVID-19 pandemic outbreak was declared across the nation and provisions of the Epidemic Diseases Act, 1897 was invoked in the entire country with name as “Janta Curfew”, where educational institutions, private multi-nation companies and many commercial establishments were shut down. India even suspended all tourist visas, as the majority of the confirmed cases were linked to other countries [14].

The Indian healthcare system is playing a major role given controlling this pandemic where its building blocks serve as a convenient device for exploring the healthcare system namely, governance, information, financing, services delivery, human resources and medicines & technologies in understanding the effects of intervention upon it. A health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health. During this time, there is a need for robust surveillance system where telehealth intervention could help in leveraging the gaps within the Indian healthcare system to act upon the existing healthcare programme. Therefore, the Ministry of Health and Family Welfare (MoHFW) in collaboration with Electronics and Information Technology (MeitY) have launched a mobile smartphone app “AAROGYA SETU” (Figure2) to help Indian public officials in contact tracing and controlling the spread of COVID-19 amongst the true positive confirmed cases in India. This not only helps in surveillance but also to alert the users and keep them safe.

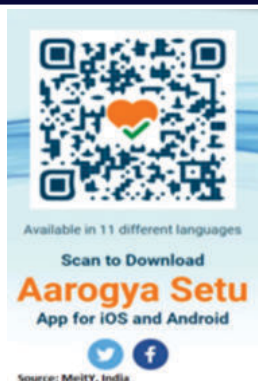


Figure: Aarogya Setu App

What is Aarogya Setu?

Aarogya Setu app is a telehealth intervention integrating social media platforms for “outreach purposes” on a “priority basis” to reach all smartphone mobile users in India. This app helps user's movement and warn them if they come in close contact with any positive case(s) of coronavirus by using the mobile smartphone's Bluetooth technology and GPS location services. It is a mobile app developed and produced by the National Informatics Centre (NIC) under MietY, GoI. Aarogya Setu is an updated version of “CORONA KAVACH” which was developed by Government of India (GoI) in February 2020 but was discontinued due to lack of several advanced features what Aarogya Setu has [15].

Implications of Aarogya Setu:

The App is aimed at augmenting the initiatives of the GoI, particularly the Department of Health, in proactively reaching out to and informing the users of the app regarding risks, best practices and relevant advisories about the containment of COVID-19. It is used as a live tracking application that uses the mobile smartphone's Bluetooth and Global Positioning System (GPS) tracking features indicating their activation time on a device to track and detect the nearby coronavirus confirmed cases and/or individual given samples for testing in his/her surroundings with a buffer range from 500 meters up to 10 kilometres (based on smartphone's location). This app also provides self-check-up assistance for the presence of any COVID specific clinical symptoms and tracking their travel history. Therefore, this app is considered to be data access and knowledge-sharing platform in the light of COVID-19 pandemic.

Compatibility of Aarogya Setu:

This app is available free of cost and can be downloaded from the Google Play Store which supports both Android as well as iOS platform [16]. This app was launched in April 2020, which supports 11 dialect Indian languages, namely, English, Hindi, Telugu, Kannada, Malayalam, Tamil, Punjabi, Bengali, Oriya, Gujarati and Marathi. Current version in use is 1.1.1 with a total size of 3.7 Megabytes occupying the mobile devices read-only memory (ROM), last updated on April, 28th 2020 (16). Till 14th May 2020, this app has crossed more than 105 million downloads by Indian citizens with 6,79,951 user's reviews. Some key permissions that this app asks users like:

- Pairing and access with Bluetooth devices and settings
- Using cellular full network access for data exchange
- View network connections
- Run at startup
- Prevent device from sleeping
- Play install API
- Interoperability - Built-in Application Programming Interface to enable other computer programs, mobile applications, and web services to make use of the features and data available by Aarogya Setu

How to Download Aarogya Setu?

This app can be downloaded from the following links;

Android: <https://play.google.com/store/apps/details?id=nic.goi.aarogyasetu>

iOS: <https://apps.apple.com/in/app/aarogyasetu/id1505825357>

Key features of Aarogya Setu: This app offers a wide range of healthcare services for its users. Some of them are;

- Tracking and tracing infected people
- Self-assessment tools
- Preventive and control measure for COVID-19
- COVID-19 updates state-wise as well as nation-wide
- E-Pass for citizens
- List of ICMR approved laboratory information
- Educational material (audio-video) for awareness
- Information about the initiatives taken by the GoI against fighting COVID-19
- COVID-19 Helpline centres
- PM Modi Relief Fund initiative
- Sharing of App via a various platform such as Whatsapp, Gmail, messenger, text message, Onedrive, Hangout, etc

Algorithm for use of Aarogya Setu:

After Aarogya Setu has been successfully installed in the mobile devices, it asks for some demographic information like registering user's name, gender, age, profession and travel history for the past 30 days. As it uses Bluetooth and GPS data, it has become a facilitator for travel in the post COVID world. Various “health code” apps have been developed by local authorities where an algorithm gives users a colour code (green or red) based on a questionnaire and location tracking. This decides whether one can enter his/her workplace, or leave city and state borders. The algorithm (Figure 3) describes how this app works in details;

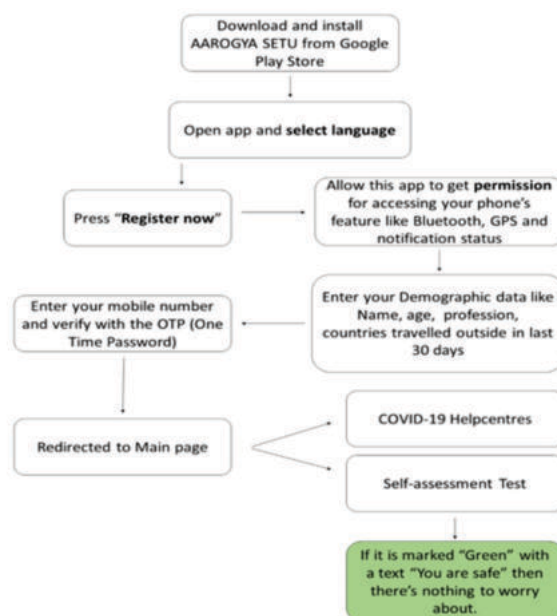


Figure 3: Technical algorithm of Aarogya Setu

This process will generate a unique Digital Identification (DID) of the registered user and when they come in contact range of their mobile smartphone's Bluetooth range, their apps will automatically exchange this DID and records the time and GPS location at which the contact took place. The information that is collected from the user's app will be securely stored on the mobile device of the other registered user and will not be accessible by such other user. In the event such other registered user tests positive for COVID-19, this information will be securely uploaded from his/her mobile device to the government server.

Data privacy:

This app continuously collects the location data via geotagging technology and stores securely on the mobile device and maintain a record of all the places user have been at 15-minute intervals. This information will only be uploaded to the server along with the DID if the user,

- Test positive for COVID-19
- Self-declared symptoms indicate that the user is likely to be infected with COVID-19
- Result of the self-assessment test is either YELLOW or ORANGE. For the avoidance of doubt, this information will NOT be uploaded to the server if the user is well or if the result of the self-assessment test is GREEN.

Aarogya Setu app ensures protecting the security of the user's information and safeguarding privacy. This privacy policy sets out the details of the personal information collected, how it collected, by whom as well as the purposes for which it is used. During registration, the user accepts the terms of this Privacy policy and the app signifies his/her continued acceptance thereof. This Privacy policy gets revised from time to time and is notified for all such changes to the users.

1. Information collected and manner of collection

When the user registers on the App, the demographic information is collected and stored securely on a server operated and managed by the GoI Server. This data is supported with DID which is used for identifying the user in the database for any related data transaction. This also captures Geotags (Latitude and Longitude) using GPS services tracking the user's geographic location through their smartphones.

2. Use of information –

All the information collected during registration gets stored in the government server in anonymized and aggregated datasets to generate health reports, heat maps and other statistical visualizations given management of COVID-19 nation-wide. Also, this information is used by GoI to evaluate and visualize the clusters of positive cases of COVID-19 at any geographic location, based on self-assessment tests and GPS locations.

This helps to trace and map the place for positive cases, often visited in past 15 days to identify the place and execute sanitization with testing more rigorous in that area to identify the emerging areas where the infection is likely to occur. Such information collected from the users guaranteed to be used for above-said purposes only.

3. Retention of information –

All the information collected after registration remain in existence into the government server.

- a) For positive cases - all collected information removed after 60 days once s/he declared as cured of COVID-19.
- b) For normal cases (who have not tested positive COVID-19) - all information gets deleted automatically after 30 days

4. User's rights -

As a registered user, one have the right to access their profile at any time to add, remove or modify any registration information that they have supplied. User(s) are free to cancel their registration at any point in time. Thereafter, no further communication will be sent to them and all the information of that user will be automatically deleted from the server after 30 days from the date of such cancellation.

5. Data security -

This app is equipped with standard security features to protect the confidentiality and security of the user's information through data encryption in transit as well as at rest.

Personal information provided at the time of registration is encrypted before being uploaded to the cloud where it is stored in a secure encrypted server. Personal information that is stored in the Apps of other registered users that one come in contact with, is securely encrypted and are incapable of being accessed by such user.

6. Disclosures and transfer -

This app also ensures that the collected user's health information will not be disclosed or transferred to any third party.

7. Grievances -

Any concerns or questions about this Privacy Policy can be addressed to the Grievance Officer (support.aarogyaasetu@gov.in)

8. Support -

This app can support up to 6 family members to use this app with Family Sharing enabled features.

Other feature - Aarogya Setu IVRS:

An interactive voice response services (IVRS) are made available Pan-India for Indian citizen with features phones and landlines providing toll-free services.

These are under the protection norms of Aarogya Setu app. Services are provided by giving a miss call on 1921. An automated response

team calls back requesting for inputs regarding their health in 11 different regional languages. Based on their responses, users receive a short message service (SMS) indicating the health status and ensuring their safety (17).



Figure 4: Aarogya Setu IVRS facility.

Source: MoHFW, GoI

Aarogya Setu Mitra, collaterals of Aarogya Setu:

Another app is available in the Indian market which is an initiative of private entrepreneurs. AarogyaSetu Mitra is a Public and Private collaboration that has come together that operates under the offices of the Principal Scientific Advisor (PSA) and Niti Aayog, with the partnership of volunteers from the private sector. This app facilitates the users for some essential healthcare services that can be availed from the safety and comfort at doorstep during COVID crisis. The services are geotagged with postal Pincode that helps create a platform for Indian citizens to connect with some key services connecting with healthcare providers to deliver at home free of costs such as COVID related telehealth consultations with some ancillary medical services such as home-based sample collection for COVID-19 tests and e-pharmacy (18). These services are supported by some of the ventures like 1mg, Netmeds, pharmEasy, MEDLIFE, Dr Lal PathLabs, METROPOLIS, SRS diagnostics and Thyrocare.

Some of the criteria set for the ventures to be fulfilled for providing telehealth services like a minimum of 100 doctors per day available, KYC responsibility, free consultation, no solicitation of patients, with minimum 95% service levels guaranteed; e-Diagnostics such as minimum 25 cities with home collection service, ability to do COVID-19 sample home collection, Lab should be NABH accredited only, phlebotomist tracking systems should be made available with minimum 95% service levels guaranteed, and ePharmacy services such as servicing minimum 10,000 Pincodes with 3+ years' experience and minimum 95% service levels guaranteed. Details available on <https://www.aarogyaasetumitra.in/criteria.html> (18).

The collected user's information is stored in a highly secured server operated and managed by the portal – (i) IP address, (ii) postal Pincode and (iii) device details used to access the portal. This portal is equipped with standard security featured to protect the confidentiality and security of the user's health information.

DISCUSSION:

Overview of Aarogya Setu:

To combat the coronavirus pandemic, the government of India has launched a new app called "AAROGYA SETU" that warns the users if they have crossed path with any infected person recently. This app has been developed and approved by the Central government and NIC eGov Mobile Apps, the developer of most government apps in India. This app is aimed at augmenting the initiatives of the Government of India, particularly the Department of Health, in proactively reaching out to and informing the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19. This application works on Bluetooth technology and GPS location to track and trace the user tested positive with coronavirus. Some added features have made this app as a knowledge exchange platform for the citizen to access the basic health information, apply for e-pass, request for medical services, etc. The information collected can be utilized by NIC by its fair, transparent, non-discriminatory manner to formulate/implement appropriate health responses. However, the data accessed and used by government entities will not be retained beyond the period necessary to satisfy the purpose for which it is shared, after which such data will be permanently deleted.

Usability of Aarogya Setu:

As an end-user, I downloaded Aarogya Setu app on my Android

smartphone and tried to explore reported features of the app. Based on the following questionnaire (Figure5) to assess the usability of this app, I interpreted the results using the System Usability Scale (SUS) about responses recorded using Likert scale ranging from 1 to 5 (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree) (Figure6)(19).

1. I think that I would like to use Aarogya Setu app frequently.
2. I found Aarogya Setu app unnecessarily complex.
3. I thought Aarogya Setu app was easy to use.
4. I think that I would need the support of a technical person to be able to use Aarogya Setu app.
5. I found the various functions in Aarogya Setu app were well integrated.
6. I thought there was too much inconsistency in Aarogya Setu app.
7. I would imagine that most people would learn to use Aarogya Setu app very quickly.
8. I found Aarogya Setu app very cumbersome (awkward) to use.
9. I felt very confident using Aarogya Setu app.
10. I needed to learn a lot of things before I could get going with Aarogya Setu app.
11. Overall, I would rate the user friendliness of this product as
12. How likely is it that you would recommend Aarogya Setu app to a friend or colleague?

Figure 5: SUS questionnaire for Aarogya Setu

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	SUS	Usability	Learnability
4	2	5	2	5	2	4	1	4	3	Good	10	80.0	84.4	62.5

Figure 6: Responses for SUS questionnaire

Based on my perception for the use of Aarogya Setu app, System usability score found to be 80 which represents how usable and learnable Aarogya Setu app is, with learnability scoring to 62.5 representing technical personnel support needed and any large amount of information to use this app. Satisfaction level of usability of this app scored 84.4 representing how efficiently this app can offer to accomplish its objective. Cronbach's alpha scored to 1.11 which means this app is highly accepted in such interventions which measure the internal consistency of a set of items included as a group within the app.

However, these scores are based on an individual level SUS assessment which cannot be generalised to a larger group or as an overall rating of the app. Therefore, to avoid such reporting bias, I have taken the feedback of responses from 4 more users qualifying for answering the questions and tried to contrast the intra and inter-scoring pattern (figure7,8).

	User = 1 No.	User = 5 No.
SUS score:	80	80.6
Learnability:	62.5	84.4
Usability:	84.4	79.7
Standard deviation:	0	8.3
Cronbach's alpha:	1.111	0.56
Adjective average:	5 (Good)	5.5 (Excellent)
Net Promoter Score:	100 %	50 %

Figure 7: SUS scores contrast between users

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	SUS	Usability	Learnability
4	2	5	2	5	2	4	1	4	3	Good	10	80.0	84.4	62.5
5	1	4	1	4	1	4	1	4	1	Excellent	8	90.0	87.5	100.0
4	1	5	2	4	3	4	1	4	1	Excellent	10	82.5	81.3	87.5
5	1	4	2	3	3	2	1	4	1	Good	8	70.0	65.6	87.5
5	1	5	2	5	2	5	2	5	2	Excellent	10	90.0	93.8	75.0

Figure 8: Likert scale scoring of users for Aarogya Setu usability

In contrast, results reveal that the overall learnability is greater (84.4) as compared to individual views (62.5), with usability score taking to 79.7 (84.4 for a single user) representing the efficiency of this app that can offer to accomplish its objective. Overall SUS score found to be more than 80 in both cases, which means it is highly acceptable, but Cronbach's alpha coefficient found to be 0.56 for multiple users which manifest that this app cannot be accepted for social science researches since it has scored below the cutoff coefficient score of 0.7. But overall users had recommended this app to others basis of their experience as "Excellent".

There is a couple of queries which need to be addressed while using this app;

1. How will the Aarogya Setu app ensure the integrity and interoperability of the collected data? If we cannot rely on collected data, then there is no point in collecting it in the first place. Also, the lack of interoperability will hamper a data-driven decision making for policymakers.

2. To what extent the Aarogya Setu app ensures the confidentiality of the collected data? Even though the users are forced to use the app, they cannot access their data being collected which was sent to an unknown server using their personal device. This I think, they cannot be held as irresponsible for the negative consequences if things don't work out as expected from the system. Ultimately leading to a potential data breach given the sensitive nature of the app.

No doubt, the best way is to study the existing protocols, borrow their strengths and weaknesses, and learn from their experiences to ensure that new/updated version of contact tracing system in India does not violate the users' privacy and confidentiality, and the system yields good results in terms of overall health outcomes more efficiently.

To me, this app looked interesting with the loaded features but not sure if the user explores the app further in future. The app can take care of itself now, and it doesn't need user intervention anymore. As long as users are kept informed, intentions are made clear, and trust is maintained, everything is possible. However, testing the SUS score with the larger group will give different reflection to this app in the Indian context.

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REFERENCES:

1. World Health Organization. Managing epidemics. 2018. 260 p.
2. Gorbelenya AE, Baker SC, Baric RS, Groot RJ De, Gulyaeva AA, Haagmans BL, et al. The species and its viruses – a statement of the Coronavirus Study Group. 2020;1–15. Available from: <https://www.biorxiv.org/content/10.1101/2020.02.07.937862v1.full>
3. Maier HJ, Bickerton E, Britton P. Coronaviruses: Methods and protocols. Coronaviruses Methods Protoc. 2015;1282(1):1–282.
4. Gorbelenya AE, Enjuanes L, Ziebuhr J, Snijder EJ. Nidovirales: Evolving the largest RNA virus genome. Virus Res. 2006;117(1):17–37.
5. Madhugiri R, Fricke M, Marz M, Ziebuhr J. Coronavirus cis-Acting RNA Elements [Internet]. 1st ed. Vol. 96, Advances in Virus Research. Elsevier Inc.; 2016. 127–163 p. Available from: <http://dx.doi.org/10.1016/b978-0-12-385885-6.00009-2>
6. Fan Y, Zhao K, Shi ZL, Zhou P. Bat coronaviruses in China. Viruses. 2019;11(3):27–32.
7. Perlman S, Netland J. Coronaviruses post-SARS: Update on replication and pathogenesis. Nat Rev Microbiol. 2009;7(6):439–50.
8. Weiss SR, Leibowitz JL. Coronavirus pathogenesis [Internet]. 1st ed. Vol. 81, Advances in Virus Research. Elsevier Inc.; 2011. 85–164 p. Available from: <http://dx.doi.org/10.1016/B978-0-12-385885-6.00009-2>
9. Yin Y, Wunderink RG. MERS, SARS and other coronaviruses as causes of pneumonia. Respiriology. 2018;23(2):130–7.
10. Symptoms of Coronavirus | CDC [Internet]. CDC. [cited 2020 May 14]. p. Coronavirus Disease 2019 (COVID-19) Symptoms of Co. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>
11. Prevent Getting Sick | CDC [Internet]. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. [cited 2020 May 14]. p. Coronavirus Disease 2019 (COVID-19) Prevent Gettin. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/index.html>
12. SMAART RapidTracker: A Global Policy Informatics Tool to Track COVID-19 Outbreak (Corona Virus Disease Outbreak) – SMAART RapidTracker – using SMAART Informatics Framework at Covid-19 Dashboard [Internet]. [cited 2020 Jul 8]. Available from: <http://www.smaartrapidtracker.org/>
13. Home | Ministry of Health and Family Welfare | GOI. mohfw.gov.in [Internet]. [cited 2020 May 13]. Available from: <https://www.mohfw.gov.in/>
14. Coronavirus Impact: India Suspends All Tourist Visas Till April 15 - 10 Facts [Internet]. [cited 2020 Apr 9]. Available from: <https://www.ndtv.com/india-news/coronavirus-impact-visas-to-india-suspended-till-april-15-2193382>
15. Govt discontinues Corona Kavach, Aarogya Setu is now India's go-to COVID-19 tracking app - The Financial Express [Internet]. [cited 2020 May 14]. Available from: <https://www.financialexpress.com/industry/technology/govt-discontinues-corona-kavach-aarogya-setu-is-now-indias-go-to-covid-19-tracking-app/1919378/>
16. Aarogya Setu – Apps on Google Play [Internet]. [cited 2020 May 27]. Available from: https://play.google.com/store/apps/details?id=nic.goi.aarogyasetu&hl=en_IN
17. Hechavarria, Rodney; López G. 濟無No Title No Title. J Chem Inf Model. 2013;53(9):1689–99.
18. AarogyaSetu Mitir [Internet]. AarogyaSetu Mitir. 2020 [cited 2020 May 14]. p. AarogyaSetu. Available from: <https://www.aarogyasetumitir.in/#onInMed>
19. John Brooke. SUS - A quick and dirty usability scale. Usability Eval Ind. 1996;189–94.