# A study on COVID-19 app's satisfaction & user attitude in digital combat of coronavirus pandemic

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*Abstract—* **With the exponentially increasing number of positive COVID-19 cases around India, the citizens of the nation are growing highly cautious and making consistent changes in their lifestyle habits. The knowledge and awareness are acting as the key to initial combating of the pandemic. This awareness has resulted in the knowledge of practicing extreme hygiene in everyday routine and is being taken up intensely. Government of India released an app "Arogya Setu" for digitally equipping the population with awareness and knowledge regarding the coronavirus. This apps related to Covid-19 reports the users about the number of new cases, recovered cases, and deceased; and also instruct the need of social distancing, hand wash, wearing a mask at public places and so on. The current study focuses on the satisfaction levels regarding these apps. The impact of Covid-19 apps on the attitude of the user. The study also examines if satisfaction influences the attitude of users. Using purposive sampling, a total of 300 users of these apps participated in the study. From the correlation and regression analysis, it is found that these applications positively influence the users' attitude and satisfaction. Subsequently, these apps have been to found to raise awareness and cautiousness to the users about following the instructions laid by the Government to avoid risks of being affected by the corona virus. The satisfaction has a significant positive impact on the user's attitude regarding the pandemic.**

*Keywords—* Covid-19, coronavirus, aarogya setu, attitude, satisfaction, medical apps, awareness

## I. INTRODUCTION

According to BBC, the world is facing its biggest challenge against Covid-19 which is claimed to be the third world war. This virus is found to be highly contagious and several measures have been laid to control the spread of corona virus. Knowledge acts as a key to attaining competitive advantage [15], and the 'Indian Government' is taking immediate measures to keep people aware and impart the knowledge of the current situation, which helps in aviding the panic and anxiety among people. And, one of such action undertaken by Government of India is the launch of open-source Covid-19 applications that enable people to undertake self-assessment tests to check if they possess symptoms of coronavirus and enlighten people about how to stay safe without contracting the infection. The main use of installing these apps onto ones' mobile is to generate *"contact tracing, syndrome mapping, and self-assessment"*. Another aspect of these applications is *updation* where the number of new cases, recovered cases,

and deceased are reported everyday; and reports on initiatives undertaken by the Government is informed. *Subsequently, why is awareness important?* Coronovirus is claimed to be an asymptomatic disease which means showing no symptoms of infection while they actually infected and, the spread level is too high. These applications either through updating videos or contents from doctors or medical experts create awareness among the public.

According to statistical report, as of Sepetember 2020, the number of apps available on Google Play Store is 2.96 million applications [2]. As of 2013, the number of apps on Google Play Store was about one million applications and the number of additions of applications in the Store has grown rapidly. These reports reveal the fact that the users' dependability for applications is elevating with each day. Applications with high numbers of downloads, ratings, and reviews such as Whatsapp, Facebook, Instagram, Gmail, Swiggy, Zomato, Myntra, Ola etc, have deeply embedded in the lives of the people. Applications pave the way for the people to lead life less complicated. The demand to develop more innovative applications to meet the needs and wants of the people is increasing steadfast.

With the invention of smartphones, it has replaced other devices such as laptops, computers, and televisions, through which one can procure information and proceed communication. Living in the present generation where *changes* (including in the lifestyle) are embraced by the people. To seek information has become a vital task now-a-days for an individual to be updated to the new and stay rationalized. Lack of information will lead to lack of knowledge, which will eventually lead to lack of awareness of an individual. The development of Covid-19 related apps aim to imbue knowledge of the seriousness of the pandemics and spread awareness through campaigns via applications. Subsequently, applications have replaced newspapers and television news channels. These Covid-19 related apps provide several informations to the users with timely updation thus creating awareness. On the other hand, *communication* is the origin of information. It is an imperative aim of developing applications. The Covid-19 related application- Arogya Sethu allow even the patients tested positive to make their presence known and send signal of their location to other users to stay watchful. It is

an aspect of communication these apps enable to spread awareness.

## II. COVID RELATED APP & AROGYA SETHU

The Arogya Sethu app was the first ever app introduced in India. Post to its launch, States Governments around India launched Covid-19 related applications that represent only the pandemic affairs associated with their respective States. These apps have millions of users with high ratings on the Google Play Store. These applications can be used directly in Android and iOS operating systems. These applications enables to send signals to the users regarding the nearest positive Covid-19 patients. Regarding Arogya Sethu, it allows status check of users' family members from one place. These applications also provide Covid-19 cases overview and give answers to users who have enquires of applying e-pass. Further, these apps allow patients who are tested positive to make their entries to alert their neighbouring users to stay safe. Therefore, Covid-19 related apps contribute inform regarding how to boost immunity, the joy of workout and yoga, addresses users why wearing mask is important and so on.

## III. GLOBAL PERSPECTIVE ON COVID-19 APPS

Covid-19 related apps were developed in the primary objective of identifying *"Digital Contact Tracing"*. The application most commonly used world-wide are as follows.

- Australia: CovidSafe app
- South Korea: Corona 100M
- Dubai: Covid19 – DXB
- Germany: Corona-Warn-App
- Croatia: Stop COVID-19
- France: StopCovid France
- Italy: Immuni

Through the use of these applications, coronavirus positive individuals can alert others around them to be cautious of contracting the virus. These applications licensed in their respective countries are highly useful and easy (eg: people can use it inside the grocery stories or inside a bus or anywhere in the public) in identifying if an affected person is next to them or anywhere nearby. But globally, past literatures arise the question of technological and ethical uncertainty [20]. Human rights activist question if there will be real risk that these kind of surveillance system will continue after this pandemic. They question if their digital privacy will be at stake. These applications work on two different modes either centralized mode or decentralized mode. In secular nations like China, Covid-19 related apps are developed on the basis of centralized mode. Large telecommunication companies grant permission to Government authorities to track the movements of the users. Centralised data storage enables Chinese authorities to track where the infected individuals spend their time. Citizens of secular nations do not question on their privacy and allow surveillance to be carried on over them to mitigate the soread of the virus. In democratic nations like India, Germany, and so on, Covid-19 related applications are based on decentralized mode. Meanwhile, in democratic nations Covid-19 related applications are developed based on decentralized mode. Government surveillance of tracking individuals' movements is unacceptable and breach of privacy. In democratic countries, tech giants like Google and Apple have rejected centralized apps. In most of these democratic countries, they are willing to only allow health authorities to track their movements. One of the issues that should majorly be taken care with Covid-19 apps is data privacy and data protection. The challenges of handling Covid-19 applications are location awareness and medical data. Users can perceive those disclosing ones' personal information of location and medical information as a discomfort. It is a highly debated issue that Covid-19 applications pose privacy risk.

## IV. LITERATURE REVIEW AND HYPOTHESES FORMULATION

### A. Satisfaction

Application development has become an important business requirement in the current generation (Luna et al. 2019). Designing of the application in such a way that is simple, user-friendly, reliable, and well-organized user interface which enables to easily access tools and options are necessary aspects to achieve user satisfaction [3], [19]. Too many ads or pop-ups or errors make users feel arduous leading to uninstall apps. Literatures have found font colors, styles, icons used in the mobile applications do create an impact in the minds of users. This study identifies whether Covid-19 related apps are satisfying to use [3], [9].

Hypothesis 1: Users are satisfied of Covid-19 related applications

### B. Attitude

This study mainly focuses on how the launch of these Covid-19 related applications influences the attitude of the users. According to the Oxford dictionary, attitude is defined as "fixing a way of thinking". Attitude is the behavior how an individual reacts or face situations from their standpoint. Today we live in a generation that has become highly technology bound, as a result, people purchase basic needs like groceries, clothing, food, and even searching for homes to live are made easy at click of a button [11]. The role of mobile applications plays a pivotal role in satisfying the needs of people from basics to luxury. The use of Covid-19 related apps such as 'Aarogya Setu', 'Covid-19 Care Tamil Nadu' and other applications initiated by other states of India, has been well welcomed reaching lakhs of users. The usage of mobile applications has been embedded deeply in people's lifestyle. Information or contents posted on mobile applications are estimated and analyzed by the users, as a result, the number of app usage among users is growing rapidly [2], [5].

On the other hand, the distress, fear and anxiety of getting infected by the virus are continuously increasing among the citizens of the country. The study is highly required during this period of crisis as it helps to create an awareness and knowledge of staying safe. According to the statistics updated in AarogyaSetu, the state of Tamil Nadu stands second among highly affected states after Maharastra. According to Covid-19 Care Tamil Nadu, Coimbatore district lies in the 'orange zone' as of August, 2020. Taken as a whole, these aspects contemplate for the need of the study. And, does these information represented in Covid-19 related applications influence users' attitude should be addressed.

Hypothesis 2: Covid-19 related apps have a significant association with users' attitude.

## C. Mobile app satisfaction and user attitude:

The mobile applications industry has experienced unprecedented growth and is emerging as a popular tool among market practitioners as they can directly get connected to individuals with just a single click. It's also an essential tool and is used for varied reasons like information gathering, shopping or watching videos. Research shows that mobile apps have an influence on the user's attitude [7], [8], [17] and satisfaction [13], [18]. Similarly research has proven that the satisfaction experienced by using a mobile app can have a shift in the behaviour of the user, inducing trust, commitment and loyalty [16]. Based on the above literature the present study proposes that Covid-19 related apps do influence on users' attitude towards the pandemic by instigating higher satisfaction. These applications provide instructions from healthcare professionals on how and what needs to be followed by users to stay prudent. These applications are the one-stop source which presents daily reports and directives for users to be aware. On the other side, it should be noted that users do install Covid-19 related apps in their mobile phones in the motive to receive information. The intention to receive information is to gain knowledge. To gain knowledge of the solemnity of the situation will thus impact the users' attitude, where these apps will guide them to abide through the instructions to protect oneself during the pandemics.

Hypothesis 3: The satisfaction experienced on Covid-19 related apps has a positive influence on users' attitude.

## V. SCALE, RELIABILITY AND VALIDITY

### A. Instrumentation:

The questionnaire consisted of two parts. The first part collected the deographic details of respondents (eg: gender; frequency of usage of the covid related apps). The second part of the questionnaire collected data on user satisfaction and user attitude, on structed questionnaires as discussed below;

- *Users' satisfaction scale*: 18-items scale was adopted from Perejon et al. [12]. Some of the questions included in the questionnaire measuring users' satisfaction are "The messages gave me good suggestions", "the appearance of the message tray was adequate", and "The messages recommended by the application were novel". The Cronbach's alpha of the scale was 0.92 [14]. Three items with low standardized loadings were removed reducing the number of items to 16. The composite reliability of the scale scored 0.93 which is acceptable [6]. The convergent validity was calculated through average variance extracted (AVE) which scored 0.65 which is above the acceptable value of 0.50 [6].

- *Users' attitude scale*: 9-items scale was adopted from Alahdal et al., [1]. Example items include "Stop travelling between cities can control the spread of the disease", "Socializing with family and friends can help to limit the spread of the virus", and "Stay at home helps to reduce the spread of the virus". The Cronbach's alpha of the scale was 0.91 [14]; hence reliability of the scale is assured. There were no low standardized loadings. The composite reliability of the scale scored 0.94 and convergent validity score was 0.45. According to [6] if composite reliability is

greater than 0.60, but convergent validity is less than 0.50 but closer to 0.50, the convergent validity of the scale is stated to be accepted. Hence, the value of 0.45 for AVE is considered for the study. The scales were measured on 5-point Likert scale (1- Strongly Disagree, 5- Strong Agree).

### B. Sample size determination

This study employs purposive or judgmental sampling of non-probability sampling technique. Respondents who live less than a kilometer away from containment zones were considered for the study. The purpose of choosing respondents who live around the affected areas is that they should be aware of these Covid-19 related applications which would help them trace positive cases at their nearest from current location. As of reports published in April 2020, eight areas in Coimbatore district were declared as containment zones (list of these restricted areas was acquired from The Hindu newspaper, 2020). The neighboring residential areas of containment zones were visited and the number of households located less than a kilometer was calculated. The population was the number of people living in the households less than a kilometer away from all of the eight containment zones. The population was approximately 1300 (apartments and individual houses). With due reference to [10], for a population of 1300, the sample size can be concluded to 297. Hence, a round-off 300 responses were taken-in for the study.

## VI. ANALYSIS AND INTERPRETATION

### A. Descriptive statistics:

Table 1 and Table 2 depict that Males are found to be the more number of users with 55.3% followed by females of 44.7%. Also, it is found that 21.7% of the users check into these apps regularly on daily, followed by 20.3% of the users checking on a weekly basis. The group of people that scored low in percentile (11%) was the non-users of these applications.

TABLE I. DESCRIPTIVE STATISTIC ON GENDER

| Users' gender | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 166 | 55.3 | 55.3 | 55.3 |
| Female | 134 | 44.7 | 44.7 | 100.0 |
| Total | 300 | 100.0 | 100.0 | |

TABLE II. USERS' USAGE FREQUENCY OF THE APPLICATIONS

| Users' frequency | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Daily | 65 | 21.7 | 21.7 | 21.7 |
| Weekly | 61 | 20.3 | 20.3 | 42.0 |
| Once a month | 53 | 17.7 | 17.7 | 59.7 |
| Every 2-3 months | 43 | 14.3 | 14.3 | 74.0 |
| 2-3 times every year | 45 | 15.0 | 15.0 | 89.0 |
| Do not use | 33 | 11.0 | 11.0 | 100.0 |
| Total | 300 | 100.0 | 100.0 | |

*B. Model fitness*

The score of TLI and CFI of baseline comparisons were 0.927 and 0.926 respectively at an acceptable level of above 0.90. The RMSEA and SRMR score were 0.079 and 0.072 respectively below the threshold value of 0.08 (Hair et al.). Therefore the model is confirmed to be fit.

*C. Hypothesis testing*

To test hypothesis 1, the mean and standard deviation was calculated. On the basis of 5-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree), the mean score of 3.38 fall between the intervals of 'Neural and Agree'. Users' satisfaction of using Covid-19 related apps do not fall in the intervals of 'Disagree' or 'Strongly Disagree'. On the whole, the users feel the use of these applications is fair. Thus, Hypothesis 1 is supported.

TABLE III. Descriptive statistics

| N | Mean | Std. Deviation | Std. Error | Minimum | Maximum |
|---|---|---|---|---|---|
| 300 | 3.38 | 0.990 | 0.057 | 1 | 5 |

TABLE IV. Correlation Analysis

| Correlation Analysis | | Users' Satisfaction | Users' Attitude |
|---|---|---|---|
| Users' Satisfaction | Pearson Correlation | 1 | 0.369** |
| | Sig. (2-tailed) | | 0.000 |
| Users' Attitude | Pearson Correlation | 0.369** | 1 |
| | Sig. (2-tailed) | 0.000 | |

**Significant at the level of the 0.01 level (two-tailed)

TABLE V. Regression Analysis

| Model | Sum of Squares | df | Mean Square | F | $R^2$ | Sig. |
|---|---|---|---|---|---|---|
| Regression | 1117.50 | 1 | 1117.50 | 46.86 | 0.736 | 0.000 |
| Residual | 7105.77 | 298 | 23.84 | | | |
| Total | 8223.28 | 299 | | | | |

There is a significant association of 37% between users' satisfaction and users' attitude (Table 4). This indicates the usage of Covid-19 related apps does have a strong association with users' attitude at a significant level of 0.01. Therefore, Hypothesis 2 is supported. Subsequently, it is also proved that users' satisfaction on Covid-19 related applications does impact users' attitude. There was a positive relationship between user's satisfaction and user's attitude, with the regression score of 73.6% (Table 3). The regression analysis supports Hypothesis 3. Thus, user's satisfaction on COVID-19 related apps has a 74% influence on their attitude.

## VII. Discussions

Psychologically, users' satisfaction is referred to as users' assessment and affective response after using a product or experiencing a service. It is commonly defined as *users' experimental judgment* of whether or not the product

or service incurred them contentment. It is the satisfaction of the users that will decide upon the applications will further be hit or failure. When an application is developed, every minute of details such as appeal, colors, fonts, content creation, user-friendliness and so on grab attention. From the results from obtained from **Hypothesis 1** it has been that majority of the users of Covid-19 related apps have found the applications to *'satisfied'*. With regard to Covid-19 applications, it is the service of *digital contact tracing* was users' main priority to install. The results may indicate that the service delivery of *contact tracing* by these applications to be on a satisfactory level. User friendliness is another important aspect that contributes majorly for the users' satisfaction. For Covid-19 applications which are predominantly developed for people around the nation during a crucial period, it is imperative for the apps to be simple, understandable, and ensures ease-of-use. Another major contribution that goes into users' satisfaction is unavailability of advertisements. Appearance of advertisements can give tiring experience for users which can lead users to uninstall the application as they no more find it interesting or informative.

Maintaining the privacy of the users is very important in democratic nation like India. These applications are decentralized and when an individual feeds his private details of tested positive for Covid-19 in the application to send alert to the people nearby, he/she will still remain anonymous. Language is another big aspect for users' satisfaction. In a diversified nation with people belonging to different states speak their respective languages; these applications are available at different languages that people can choose to use.

With respect to **Hypothesis 2,** the study has proved there is association between Covid-19 related apps and users' attitude. One of the main aspects of these applications is to create awareness and send timely message of updates to users to stay well-informed. In the present study, attitude is generally measured on the basis of how users perceive the regulations laid by the Government such as lockdown, wearing of mask in public, avoiding social gathering, following social distancing etc. The test of association to be significant or non-significant is based on how much cooperation and acceptance they have for the regulations. If the majority of the users have no cooperation or hold difference of opinion will not have association. This study proves users have 73.6% of association which proves they are very welcoming to the rules and regulations implemented by the Government during the pandemic.

This study also proves that technology is one of the fastest modes of awareness campaign that will reach more number of people in a short span of time. Rather than any gadget, smartphones have deeply imbibed in people's lives and applications are one of the best ways to spread awareness. This study also enables to indentify that majority of the people support the pandemic rules and understand the severity of consequences that an individual had to undergo in case of not following them. Attitude is the mindset that an individual possess towards the pandemic and an individual's attitude is measured based on their acceptance of pandemic

regulations. This study emphasize that to follow the pandemic regulations laid by Government is important for the safety of oneself and of the people around them. To support the pandemic regulations will help to mitigate the spread of the virus and reduce causing future damage.

**Hypothesis 3** proves that usage of Covid-19 related applications does influence the attitude of the users. Content creation is an important aspect of the applications that decide if it is worth the time using or not. As mentioned earlier, these applications provide not just awareness but also instructions from healthcare experts about the do's and don'ts. During the crucial period of pandemics, it is necessary to obtain medical support and these applications pave way even at smallest of way possible to ensure the safety of users. The results prove that Covid-19 related apps influence the users in a positive manner. Users perceive the use these applications are helpful, supportive and cooperative.

## VIII. PRACTICAL AND SOCIETAL IMPLICATIONS

As the fight against coronavirus continues worldwide with increasing cases of coronavirus infected individuals, contries across globe are literally beig forced to slowly ease the lockdowns to protect their economies from crashing. The new moto is surving with the COVID-19 virus, till a vaccine is found. With these ease on lockdown comes the a lot of risk and constant fear of successive waves of COVID-19 apndemic. In such situatin the awareness and as much information availability on the virus provided by authentic source is becoming more and more crucial. The digital platfoem, especially the apps related to coronavirus are playing a mojor role in knowledge dessimation. Although more research needs to be done on the efficiency of individual apps; these are the best available options for easy information dessimintaion, to both normal public as well as frontline warriors.

The Covid-19 related applications can induce the system of facilitating online doctor appointments at the free of cost to the people. This would ensure safety and save a lot of time to the doctors and patients. Second, Government initiated healthcare applications for other fatal diseases like cancer, malaria, tuberculosis etc can be made available to the people with online appointments at free of charge. Third, these applications should provide facilities of *live discussion* that would enable users to send messages to the healthcare professionals of their queries during the pandemic and receive message from them. Through this way would guide them to stay informative. Misinformation about COVID-19 is rampant, thus, its important that government regulate these apps, so no wrong informations are spread using these apps. Similarly, faulty updates, errors and malfunctioning of these COVID-19 related apps can cause a lot more damage than their intended benefit for their users. Mostly apps developed in India are focused on contact tracing or symptoms checking unlike western coutries where apps are mainly concentrated on information dessimation with less focus on contact tracing and symptoms checking, due to the fear of data leak and identity theft. Thus, more apps creaters in India can focus strengthening the privacy and safety of user informations collected by users.

## IX. LIMITATION AND FURTHER RESEARCH

Like all research, our study also has some limitations, like the sample size is limited to 300 respondents and further research could be carried out among a larger sample size. The same research with applications of other classifications such as games or e-commerce payment system or multimedia messaging apps can be considered for upcoming research studies. Further researches should concentrate about do these applications reach a large extent of Indian population. It is required to address whether people living in the rural parts of the country are aware of Covid-19 related applications and its uses. The author further emphasize that the same study could be carried out at other districts of Tamil Nadu.

## X. CONCLUSION

The findings of the study have proved that satisfaction of COVID-19 related apps has a positive influence on their attitude, creating a positive attitude. Ultimately, the reason to develop Covid-19 related applications to create awareness among the people during this high period of crisis. The result of the study seems to reach the goal for why these applications were created. The people of Coimbatore district have well welcomed these applications and make use of these apps for their betterment and well-being. From discussions with the public during data collection, it could be learnt that people have become highly cautious about places they visit, people they meet and greet, what they consume, or what they even touch, in order to ensure safety. They also admitted to be wearing masks, washing hands, and maintaining social distance to stay away from being infected. From inquiring about if these applications are informative, the majority of the people agree it is useful. Inspite of so much technological upgradation made to educate people on the significance of the situation, unfortunately the number of the cases is still on the pace of increasing day-by-day. Amidst strict rules of lockdown and educating safety measures through every mean of communication, the numbers are yet on the verge of rise.

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