

# Mobile Ubiquitous Computing Solution to Analyse the COVID-19 Infection Information

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## Abstract:

The COVID-19 affect for human civilization and global financial breakdowns in all over the world. Travel, Transportation, human movements, social gatherings, are literally prohibited to minimize the disease distribution. The world continuously questing revolutionary ubiquitous computing practices to interact and struggle with the Corona virus and overcome from this life-threatening danger. The use of ubiquitous computing technology is an appropriate method that the entire world is capable to use with embedded laptops, computers, sensors, mobile phones, processors, and other digital devices in whole over the world. This paper distilled new trends and solutions in ubiquitous computing to get information about the COVID-19 infection rate, affected people around the world, news alerts, quarantine details, prediction information in the country. It clearly represents different fields and sectors which required to magnify the practices and potentials of ubiquitous computing during the quarantine. The challenges of ubiquitous computing during the active management and practices of solutions are described further. The proposed methodology with the mobile device design is highly concentrated chapters in this paper. A discussion about ubiquitous computing solution to analyze the information about Covid-19 information is added. Moreover, the conclusion about the solution and recommendations are mentioned at last.

*Keywords* — Mobile Ubiquitous computing, covid-19, analyses, solution, device

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## I. INTRODUCTION

Covid-19 is a worldwide influenced infection for both economy and lives of human beings. The infection rate around the world, news alerts, quarantine details, prediction information are several crucial data for the country as well as for the whole universe. Associating these rate from the infection and the risk of infection. These data will help to minimize the death rate, distribution rate, and infection rate while aware of the people about how dangerous the situation while advising the people about precautions.

Ubiquitous computing gathers the environmental electronic information comfortably and conveniently with merging into an infrastructure of computing and physical combination. Thousands of devices and sensors which could consider as

connectors of ubiquitous computing, will provide new functionality, worldwide connectivity, specialized services, and boost productivity and interaction[1].Ubiquitous computing magnifies the practice of digital devices, computers, sensors through effective availability within the physical environment. Mark Weiser [2] stated ubiquitous computing as a goal to reach the utmost competent technology and build computing as much regular as electricity. When considering the ubiquitous computing, small devices, new application practices, network protocols, etc. were the first focused areas and with the development, the new paths were emerged as wireless communications, power consumption, location recognition, resources detection, and privacy.

Pervasive computing is another technology that depicts mobile data access, high storages and

context alertness. Advanced interface modifications, enabling the efficient user interactions among the environment with the use of devices, new functions implementation on devices are several specific tasks of pervasive computing. The increment of the pervasiveness of computing enables new abilities in digital environment and new classes in ubiquitous computing applications. The applications that considered under pervasive computing doesn't operate automatically but they interact actively with available resources to contribute adaptive, reactive and spontaneous experience to users.

Introducing a new vision to ubiquitous computing paradigm, the Multi Sphere model was defined by Wireless World Research Forum (WWRF) that includes numerous levels: radio accesses, cyber world, immediate environment, personal area network (PAN), instant partners, and interconnectivity[3]. These stages allow to launch new advancements and user expected requirements in computing paradigms and software techniques. The most crucial challenges and limitations are based on the requirements that embedded with complexity and intelligence in ubiquitous computing devices. Information processing began using mind power of mankind, growing of thinking skill accomplished the computer revolution, and most of the people began to use a big computer kept at a steady location. The new technologies and findings brought the computer technology to movements and small tiny devices with huge work processing. Currently, the digital devices and mobile ad-hoc devices became major necessity in most of parts in human life due to the reason of easy maintenance and efficient daily work accomplishment using these devices. The invention of Internet and Internet of things made huge development in every field including the Health sector. Data and information play a huge role in the internet and Covid-19 updates are most crucial during the current situation of the world. Health organizations and all human got the right to know and required to know the current status of the infection and new solution should discover with the help of new technologies and practices. The people

should able to access those data of infection which are available at any time at anyplace. The rising of mobile devices plus internet connection, signify the access to these data through even using a smart-phone or tablet[4]. This facility of accessing the infection help to provide many benefits to the patients, medical staffs as well as all human kind in the world.

## II. LITERATURE RIVEW

Typically, ubiquitous computing utilizes the modest information and communication technologies, which advanced in the fields of communication technology, information security, microelectronics, sensors, the energy supply, in user interfaces, localization technology. In the area of micro electronics, as it mentioned in Moore's Law, it can be presumed that in the next 10 to 15 years logic and memory apparatus will become very smaller and more powerful, and, considerably cheap[5]. New technological components like transistors, capacitors, inductors, resistors, diodes help to ensure that ubiquitous devices are more convenient, small size, conceivable objects and less energy consumption for operation. Communication technology, more specifically the mobile communication, is measured as the core technology in ubiquitous computing. Currently, these ubiquitous computing communications based mainly through standard technologies like Ethernet and by self-organizing ad-hoc networks. The significant technologies of the personal area networks belong primarily near field communication (NFC) and ultra-wide band technology (UWB), provide the capability to secure broadband transmission, as will be common in future in the data exchange between the end devices and among terminal devices and communication infrastructure [5].

Mark Weiser suggested taking a diverse approach anent a higher level of sophistication of computer-based solutions which had been the objective of AI (Artificial Intelligence) [6]. He stated it more

reasonable to be interested on minor subsections of "intelligent behaviour" and devote every computer to such a subset. Integrating special-purpose computers and collaborating on them will provide greater innovation. By positioning and interconnecting sensor-based small devices, it is capable to interact with environmental data (location, temperature, lighting, movement, etc.) and those collected data could analyse and calculate with the use of computerized physical objects. When magnifying about artificial intelligence, the ability and collect information from the massive data streams including human biological and behavioural data, it enables to AI systems to learn more human routines, adapt to mankind preferences, detect the infections, disease and predict the behaviours [7]. Instant alerts when the need about environment changes, one-click ordering, voice commands, smart music playlists, medical alerts and more things are getting as the return for that combination of AI and ubiquitous computing. AI devices are capable of predicting human needs even the person got the opportunity to forget. The emerge of big data sources, machine learning algorithms, and AI provides the combined path for ubiquitous computing, but currently, ubiquitous computing got a specific identity in its own way. Moreover, without the means to collect the granular data ubiquitous computing provides, people wouldn't be able to get the complete picture that enables machines to adapt and truly build intelligence [7].

Radiofrequency identification (RFID) is considered as a generous technique for recognizing and localizing things from a distance in ubiquitous computing [5]. This automatic identification (auto-ID) is a crucial base for numerous current applications of ubiquitous computing. A unique identification number and more information are saved, allow to read and capable to store a hundred bits of information in these on an RFID chip. Today RFID chips and RFID transponders prizing as their performance. The RFID technology is being driven by possible applications in the field of logistics: if

products can automatically reveal their identity on demand, then a continuous tracking and tracing of the flow of goods throughout the complete supply chain without manual interventions can be guaranteed [5]. Further pertaining details could store in a remote database of RFID chip and after analysis, the identification number the supplementary information could recover through a mobile or immobile connection and due to that, any quantity of comprehensive related information can be stored. This feature facilitates for application possibilities, that range beyond to automatic storage system and supply chain management. The high price is the most effected challenge or barrier in RFID transponders and system integration when considering the market sale. The new manufacturing materials and production processes (polymer electronics) provide the facility to reduce the cost [5].

The requirements of ubiquitous computing environments are interoperability, heterogeneity, mobility, adaptability, security and privacy, self-organization, and augmented reality and content scalability [3].

Interoperability is the most crucial requirement for ubiquitous computing due to the increment of network products from various sellers. The growing number of microprocessors and quantity of networking depicts the requirement of distributed software platforms which are appropriate for wireless computing[3]. Interoperability can state as the capability of software to disclose the exchanged information and to offer new entity initiating from interchanged information. This can be observed when element and the relayed interactions are expressed in detail and lastly observed in executable models, simulations and running systems[3]. Integration architecture can be introduced as a solution of software architectural explanation to interoperability problems among numerous component systems. In ubiquitous computing, heterogeneous networks capable to form integrated networks which allow connecting devices with varying features like radio possibilities, screen resolutions, memory, mobility, user

interaction methods, and processing capabilities. Services can be accessed with widely varying transport capability, quality and usage cost, and they may have different requirements for bandwidth, real-time capabilities, and input-output methods[3]. User interaction mechanisms are crucial to connect with devices using multi-modality for instance speech, hand movement, screens, buttons, etc. The embedded sensors are the components and newest solutions that require to support these interactions. Heterogeneity of software can be expressed using the multiplicity of software structures, component models, interface techniques and computer languages. Mobility is a crucial characteristic of a ubiquitous system. Mobility can be recognized in different schemes, such as service mobility, terminal mobility, personal mobility and session mobility. Users should be supported in such a way that they can move from one place or terminal to another and still get a personalized service [8]. Networks may also be mobile and dynamic, and full mobility is the requirement of the ubiquitous wireless world [9]. According to software perception, mobility is categorized as actual, virtual and physical mobility. The capability of transferring the execution, for instance, the codes, execution data through the nodes which supposed to access the information of software agent is known as actual mobility. Actual agent mobility is capable to enhance reliability and efficiency of execution including the ability to save network bandwidth. The capability to alert the diversity of network execution environment is known as virtual agent mobility. The capability of completion of the task on time with the occurrence of attacks and failures is known as survivability and security survivability. Survivable systems require a self-healing infrastructure with improved qualities, such as security, performance, reliability, availability and robustness [10]. A core feature of a survivable system can be mentioned as the capability of delivering crucial services while effected with the attacks, accidents and failures. Survivability is a term that depicts several quality attributes, for instance as performance, security, reliability,

availability, and modifiability [3]. Adaptability is the ability to adapt to numerous terminals and networks by a software service. They also have to handle dynamically emerging and evolving contexts and user preferences [3].

A ubiquitous system consists of numerous kinds of radio capabilities. Due to the changes in mobility in ubiquitous systems, there are some considerable challenge for the adaptability feature. For this reason, there are some adaptation strategies. According to the laissez-faire approach, the responsibility of adaptation is left to individual applications and no system support is provided for adaptations [3]. This approach is minimizing the resource demands and limits the resource practice of diverse applications. The implementation of applications become harder and more due to individual implementation of adaptation function by each application, the size of the applications is high [11]. The application transparent approach is another adaptation strategy and it supports for application implementation without any changes and the underlying system is responsible for the adaptation of the application. Self-organization is the capability of a system to extemporary increase its organization lacking the administrative of the environment and external system [3]. Self-organizing systems create their own organization and controlling or adapting their behaviour. Self-organization spread over for the concepts of self-learning, expert systems, chaotic theory and fuzzy logic[3]. Self-organization feature is using for the communication networks, for instance, ad hoc networks, with the intension of gain better performance, to increase efficiency, to enhance the reliability and survivability and efficiency, and to reduce the cost. Ad-hoc networks contain numerous dynamically linked devices as well as the wireless media [12]. Ad hoc networks are considered as self-organizing networks due to its automatically organizing ability with the short of static configuration and centralized monitoring. Augmented reality and scalable is a feature of ubiquitous systems that extended to the new ways of looking at the content, like augmented reality,

are emerging[3].The requirements of this feature consist of several perspectives, for instance, digital rights management, self-organization and semantic awareness.

The ability to utilize the information in numerous ways is the overall use of ubiquitous computing. The facility of retrieving the information from the entire world which was impossible during past and the facility to control the devices and types of machinery at any location in anytime which were monitored by embedded computers before are two specific points of ubiquitous computing[13].The easy communication, sense the natural environment through sensors that supported by physical devices, are several indirect points to count as the benefits of ubiquitous computing. Security threats of mobile portable computing devices comprising the integrity and availability are malicious code, attack on communication path from wired network to wireless network, and data robbery & damages[13].The possibility of getting attacked by malicious software like trojan horse, virus, the possibility to loss the sensitive data, unauthorized device connectivity and access, Intercepted or Corrupted data, Unauthorized Bluetooth or Wi-Fi access are some security issues in ubiquitous computing.

Due to the rapid increase of societal challenges day by day, the use of ubiquitous information techniques plays a vital role these days. Mainly, it helps to minimize the cost by increasing the efficiency and productivity in the modern healthcare system. Contemporary it increases the quality of health care. The use of Ubiquitous computing methods for healthcare applications consists of rather medium- to long-term implementation perspective. Due to rapid development of health care system, it is a necessity of having much higher demands on the technology performance for possible applications which is linked with ubiquitous information techniques in diagnostic, therapeutic, nursing and documenting functions for their healthcare facilities. Ex: when administrators asking for more comprehensive and

higher quality information of the medical and nursing personals

Ubiquitous information techniques may assist senior citizens who already suffer from chronically ill within their home environment. Ubiquitous information techniques can be used as obligatory resources that are used to improve the quality of life and enrich everyday life in old age. (AAL) ambient assisted living includes the concepts of Ubiquitous computing techniques under the terms of health telematics. The (AAL) includes concepts, products and services have made a great combination of new technologies and the social environment[5]. The ultimate goal of this combination is to increase the quality of good care of elderly persons who suffer from illnesses and respectively maintains their home environmental life. These kinds of systems consist of automatic remote and self-monitoring and diagnosis for patients. More importantly, this leads to increase the possibilities of having better medical care of senior citizens who lives in their homes independently to give such kind of service for Ubiquitous computing techniques recorded parameters and motion data of the patients[5]. The home environments of these elders' citizens are also monitored. To be monitored such persons, it uses necessary sensors which integrated to clothes such as a belt with a microcomputer embedded it and the data is collected through that belt. An alarm can be set off for emergency situations. The importance of the emergency services depending on the seriousness of their illnesses, age, home environment and the situation.

In the last decade (AAL) Ambient Assisted Living has been massively promoted [5]. In present, there are a few marketable products and a limited market for AAL products and services. Massive involvement of competitors from the ICT industry is the major threat to AAL products and services. The financial crisis in several health care insurance companies, lack of involvement of healthcare professionals, lack of interoperability of technical solutions, decreasing the standards of several health care sectors are considerable market barriers.

Ubiquitous computing can be used to optimize processes in the healthcare system. To optimize the process it generally follows the same logic, which is found in trade, industry and logistics. These systems applied to hospital administration as well as patient to increased planning and scheduling security of medical examinations and high utilization of medical equipment[5]. In present these systems only support for single processes such as access management or obligatory documentation. These systems help to identify automatic localization of patients, materials and equipment or the mobile monitoring of measured data[5]. It is technically necessary to having sensors and input devices for the transition of integrated details between hospital management and patient with vast coverage. This kind of situation, in particular, the location of the sick and the location of the equipment that monitored the patients situated in hospital environment must be ascertainable by means of suitable techniques[5]. To support patients and people who need health support appropriately, the connection between them and the equipment's must be automatically recognized. Some doctors have doubt full minds and questioning about this scenarios individually as well as mutually whether this equipments have better ratios on identifying and facilitating work for the health care administration by simplifying processes or only encourage the tendency towards the transparent patient[5]. When it comes to ubiquitous computing, on aggregate the most difficult area to be covered is the healthcare area for sure. As we all know Medical and the security data's are the most important data that are protected by any government recently. When it comes to medical data, it is the most sensitive personal data which require an appropriate data protection measure. These kinds of data shouldn't allow any access to secondary users. The financing of pervasive healthcare« has created some issues under the existing reimbursement regulations and created distribution battles among the agents who have issues of whether the home environment should be promoted as a healthcare and nursing

location [5]. According to the above reasons applications which implement for alone healthcare sector should have a long-term perspective. It should be implemented step-by-step there are few numbers of ethical issues arise when it implemented in captions security, autonomy and participation areas.

Pervasive computing includes mainly three things. Like the first, it cares about the way people view mobile computing devices and the way of using those devices to fulfil the requirements and to perform tasks. As the second it cares about the development, creation and deployment of applications to fulfil the user requirements and tasks. As the third, it concerns about the environment and how it is enhanced by the emergence and ubiquity of new information and functionality[14]. Pervasive computing is the trend in progressive ubiquitous connected computing devices in the environment, a trend to extend up to merging of advanced electronic devices, interacting through wireless technologies and the Internet. Pervasive computing devices are not only extended to personal computers as the generals tend to understand, but it could be very small devices which could be invisible. These devices could either mobile or embedded to any type of thing, for instance, cars, tools, appliances, clothing and various consumer goods and the communication are possible through these progressive interconnected networks. Today, pervasive computing is added as an art than technological science. It will endure this way as long as people continue to view mobile computing devices as mini-desktops, applications as programs that run on these devices, and the environment as a virtual space that a user enters to perform a task and leaves when the task is finished[14]. Thus, pervasive computing appeared with the combination of areas: embedded and mobile devices/ systems, wireless communications and extension, and context-aware computing. Uninterrupted advancement in integrated circuit and the processor designs has caused the expansion of more powerful and tiny computing devices than ever before[15]. Miniaturization and complex

circuit design enable the ability to embed computational logic to several specific devices, extend from toasters, shave machines etc. to automobiles, for instance, the devices that facilitate communication among home appliances and the devices that could adjust the road and traffic conditions [16]. That much of convergency of computational ubiquity contributes a mechanism to regulate the user perception and invisibility of those systems. Those embedded devices with that environment require wireless communication abilities to assure the invisibility of the system and to join with the communication among multiple devices or components of a pervasive computing system.

Pervasive systems usually practice the wireless communication technologies, for instance, Wi-Fi, Bluetooth and RFID sensor technique and prevailing communication protocols that are using to combine with those special designed pervasive systems.

Though traditional infrastructure-based communication systems usually afford networking services in static ranges, pervasive computing systems struggle with a variety of unique issues due to the ad-hoc and dynamic topologies; and these issues comprise power management, location alertness and fault tolerance [17]. The immigration of computing power from desktop to usual environment announces novel matters in human-computer interaction. Old-styled input devices for instance keyboards and mice, not working as tools for reaching system interaction further. Currently, we deal with modern trends to develop new interactions that are very natural and user-friendly to people, for instance, integrated touch screens, tablets, or voice and behaviour recognition systems. Multimodality exhibits a crucial role in providing added common interfaces that give an allocation for the finite availableness of input and output devices [18]. Prevailing mobile devices consist of more sensitive touch screens, a keyboard which are highly performing, batteries that able to easily and efficiently recharge even by portable power storages, hardware and software components which

supports for the device applications. Wireless communication technology is a crucial element that contributes invisibility in pervasive computing systems [17,2]. Three varieties of wireless communication networks available namely personal area networks, local area networks and wide area networks. Personal area networks consist of different implementation technologies including IrDA and Bluetooth. The Infrared Data Association (IrDA) interface was one of oldest commercial implementations and it is an infrared-based, short extended wireless communications protocol which had a 115 Kbit/s of transmission rate [14]. The low transmission rate and shortly extended communication range are the main drawbacks of IrDA technology. WiMAX, (Worldwide Interoperability for Microwave Access), is a technique of telecommunications-based on the IEEE 802.16 standard which merged as an alternative technology with the capability of accessing wireless network within long distances.

As Weiser mentioned [2], “tabs, pads, and boards are just the beginning [of pervasive computing systems]. The real power of the concept comes not from any one of these devices; it emerges from the interaction of all of them. Currently, mobile and smartphones developed to the ubiquitous device that provides numerous functions, internet connectivity at any time, anywhere, which distilled as the major requirements of mobile users. The pervasive environments contribute the facility to access ubiquitous information services and these two technologies support to maintain the human’s nature which means by interconnection among other persons, groups and events. Mobile and smartphones are presently considered as the finest tool to access information services and it’s due to the natural and practical interfaces of them, which provides an improved interaction through the pervasive environments[14]. Today, the mobile and smartphones take priority among the best tools for accessing information services as long as they have a high natural, attractive, developed and practical interface.

Miniaturization and decentralization are terms of mainframes that initiate the personal computing era including one decentralized system with fixed individuals. Moreover, Unification of computing and communication is challenging to huge desktop computers while arriving for smaller and more leading devices [19]. The specific tools like personal digital assistants (PDAs) and smartphones capable of supply the services that existing anywhere, at any time and for any authorized people. With the technologies the privacy and data security became crucial and that effect for computer ethics in a better way. Pervasive Computing Environment (PCE) consists of smart materials, sensors, embedded systems, digital devices, connection with low cost and low power, IoT (Internet of Things) and pervasive computing applications. The core desire of pervasive computing environments is to contribute more comfortable mobile gadgets and the facility of digital support enabling the socialize, supportive, easy operative service environment[19]. Social media play a huge role during infectious disease by communicating verified facts, outbreaks of infection. Social media usage became for the major position as the most popular online activities. According to the statistics, it estimated about 2.95 billion people were utilizing social media in the entire world in 2019, and they expect that this number will increase to almost 3.43 billion in 2023[20]. Most of the tweets with hashtag "#coronavirus" are distributing information, and many of them initiate from genuine sources and organizations, for instance, the WHO[21]. The social medial capabilities and facilities, for instance, the geographic information systems (GIS) and procedures, online real-time mapping of illness cases, predictive risk mapping through the population travel data are allowing the users to access for the data timely, understand and alter about the risk and get precautions.

NFC stands for Near-field communication. NFC supports for ubiquitous devices to easy and efficient communication between the devices. NFC enabled to communicate through magnetic field induction. It

is a short extended wireless technology extend to about a 10 cm distance, which facilitating smarter possibilities to your smartphone, payment cards, tablet etc. Shorter set-up time is the advantage of NFC when comparing to Bluetooth.

NFC support the users to transfer information between the devices with a single touch for instance to bill payments, exchanging business cards send directions, sharing documents, photos, videos, web pages, contacts etc[22]. NFC allows communication over two fields and transferring data across the electromagnetic radio fields,

NFC is one of the fastest methods of wireless data transfer without an internet connection. There are three operating modes of NFC technology and they are Card emulation mode, Reader/writer mode and Peer-to-peer mode. Card emulation mode puts the NFC device in neutral communication mode. The device works exactly like a smart card. The external card reader access the device security features like Universal Subscriber Identification Module (USIM) and embedded Secure Elements (Ese) that are companionable with the contactless card technology. Mobile payments, ticketing access are coming under this category. In Reader/writer mode, the NFC allowed devices facilitate to write and read data on NFC tag. The device functioned neither or both read and act according to the written tag. Two powered devices can be used for peer-to-peer mode, which is NFC specific. This mode allows the conversation between the two devices to be networked together. During primary communication, the two devices decide the communication parameters such as data block size. The extreme data block is 256 bytes [23]. NFC tags can be introduced as tiny physical "tags" or "stickers" which consists of programmable NFC chips which capable to deliver a variety of information to the user smartphone. Generally, NFC tags consist of links to a web address, and it could be a controlling device for a set of functions like Wi-Fi controller, ring tone controller of a smartphone [24].

### III. PROPOSED METHODOLOGY AND PROPOSED DESIGN TO MOBILE DEVICE

Social media seems the most popular method to search and get information in the current era and it contained many platforms in different ways. A model to filter Covid-19 information would be a progressive and better method that helps ordinary people.

From the literature review, the distilled idea seems that a possible solution can be introduced as an application that depends on social media to filter the Covid-19 information and data. There are some possibilities to finalize a model to filter these data from social media like Facebook, Twitter, Instagram etc. The model should able to apply and filter data from any social media when the user specifies the source. More specifically the final idea could express as if the user prefers to access and see the information and updates of Covid-19 infection only available at Facebook, the application should capable of it. Furthermore, if the user would prefer to access all the information in social media, the application capable to do that by filtering and searching. It is the most convenient way to access the Covid-19 data and updates for ordinary people. Considering the below-given reasons the social media mainly Facebook, Twitter and Instagram and Google search engine are chosen as the base for this application development due to the reason that they are the popular applications in present and more data available with photographs, videos, descriptions which easily accessible by others. This application basically analysing the user-added data like dates, keywords, pictures, videos etc. The main source of this application is user already prevailing user data or user-uploaded data. It is a far easy and efficient method to access the information due to the reason that this application provides the filtered data about COVID-19 in social media like Facebook, Twitter, Instagram and from google. This application allows filtering data by keywords and dates which enables the users to access the up-to-date, data and information about the COVID-19 infection almost all around the world.

Both primary and secondary data is using for this application developments. The primary data is collected through social media by searching and filtering the data by keywords related to Covid-19. Pictures, videos, descriptions, news alerts, quarantine details, prediction information are counting to continue this application development. Secondary data is gathering with the use of google forms. The users are able to fill the google forms about how it influenced for themselves and experience about the infection. The google form is consists of questioners about Covid-19 in detail way. This collected data is analysed by the application and allow to see the summarized information by graphs and charts. For an example, the application allows seeing the number of infected people, how bad the infection experience, the precautions they obeyed, infection rate, affected people around the world etc. The Facebook API, Instagram API, Twitter API and Google Custom Search JSON API use as the media of the implementation. The videos, pictures, descriptions about COVID-19 will be used as primary data. From these collected primary data, the relevant data is filtering using API s. The filtered data will analyse logically and sequentially to develop the application to analyse and provide access for that information.

When the user prefers to use the application without the internet connection, NFC technology will able to retrieve data, which providing the facilities to open the web URLs, pictures, videos etc. NFC tags should available to a web search. NFC tags provide the facility to share the information in social media and send emails to others about the collected data. When the user prefers to continue the search with NFC technology, the data is collected by NFC tags and the rest of the process will follow with the filtering process.

#### III.I. WORK PLAN AND METHODOLOGY:

The information is gathered using a Search API which is available in Twitter, Facebook, and Instagram <http://twitter.com>, <http://facebook.com>, <http://instagram.com> and

<http://twitter.com>The live news is collected using “News API” (<https://newsapi.org>) which could be mentioned as a HTTP REST API, and it specifically designed to search and retrieve data. The keywords and dates relevant to the news are collected using these API s. Moreover, Google Custom Search JSON API using to retrieve and display searched data and information from Google Custom Search programmatically. This API permits to use RESTful requests to gain web exploration or image search outcomes in JSON format.

When the user prefers to use the application without the internet connection, NFC technology will able to retrieve data. The NFC tags provide the facility to share the information in social media and send emails to others about the collected data. The NFC tags are important things to web search and this will also help to collect data to continue the application process. When the user prefers to continue the search with NFC technology, the data is collected by NFC tags and the rest of the process will follow with the filtering process.

The keywords related to COVID-19, are collecting according to an order of recent date to past dates. With satisfying recognition of keywords, the information will be discovered through “Search API” of Facebook, Twitter, Instagram. And when it comes to Google, it is the Google Custom Search JSON API. The collected keywords are filtering according to the date.

The locations of the COVID-19 information are collecting by Geo-location API and Online three-step method to collect the location of posts more accurately.

The application is developing to analyse these data to produce the final output from the searched and filtered raw data which could be a graphical analysis, pictures, videos, descriptions, news alerts, quarantine details, prediction information etc according to the order of the dates from newest to old.

The available Google forms are allowed to fill by the users of the application and with the gathered information, the graphical analysis about infected

people, the precautions they obeyed, infection rate, affected people around the world. The application produces the graphs according to recorded data. The Google form is consists of questioners about Covid-19, as for example whether infected or not, recommended precautions, experience about the infection etc. The application provides the graphical analysis on recommended precautions, infected rate, infected people experience level which means of normal, bad, very bad, or deadly.

### III.II DISCUSSION OF THE PROPOSED SOLUTION

The following figure will demonstrate the methodology clearly.

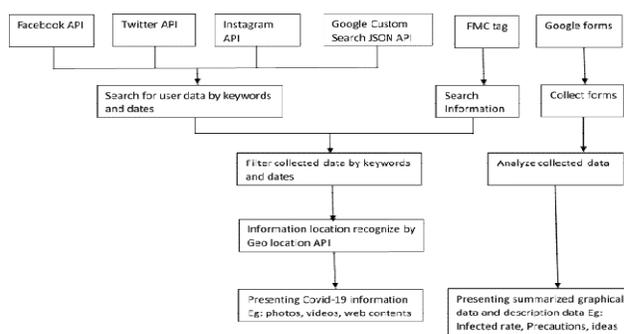


Fig 1. Summarized illustration of Application working process

As it sketched in the figure, “Twitter, Facebook, Instagram, Google” is selected for the base of the application development. The user data is collecting by searching Twitter, Facebook, Instagram, and Google using the keywords related to COVID-19 and Locations by keywords. The searched collected data are filtering to relate the given searching keywords to pick the related data. The location for the given searching keyword is recognizing through Geo Location API. The collected, filtered and related data are analysing to get final filtered data about the given searching keyword which could be a video, analysis of the chart, graph, description or photograph. The data collected through google forms produce a clear graphical analysis about

Covid-19 infection according to the collected information up to that moment.

The ‘Google Custom Search JSON API’ resulting from the search data in JSON format and "JSON" stands for “JavaScript Object Notation”. It is a schema-less, text-based representation of structured data which supported by libraries in most major programming languages. JSON data files ends ‘.json’ extension these stored files human-readable and simply plain text files which enabling easy open and examine.

NFC technology is important when there is no internet connection. The NFC tags are crucial for web search and it is a small unpowered NFC chip. The web searches are allowing when there is only an NFC tag. This application is using NFC tag open web pages, share information and send the emails when there is no internet connection.

forms. And during the last layer, the data present as analysed graphical data according to the Google forms collected data, finalized and analysed descriptions photos, videos, web content.

The developed and implemented model will publish as an application on the web. SDLC which stands for Software Development Life Cycle is providing better management for the development process. It allows to Gather Requirements, Design, Development, Testing, Implementation and Maintenance of the System in a proper and clear managerial way with limited issues. Among lots of SDLCs, Agile Scrum methodology is selected for the development process. As the reason for selecting this SDLC methodology, it’s special feature should mention that the development could process after completion of one iteration. Clearly, the development process couldn't continue until one iteration is completed and tested.



Fig 2. Architecture Diagram of Application

As it showed in fig 2, the first layer is searching for data uploaded by users to the social media and available on Google. The FMC tags are using to search for data if there is no internet connection. During the second layer, the data is collecting and MYSQL database is using for store the collected data from social media as well as by the Google forms. During the third layer the collected data filtering, processing, detecting location and filter by date including the information collected by Google

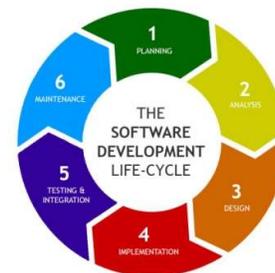


Fig 3. Software Development Life Cycle [25]

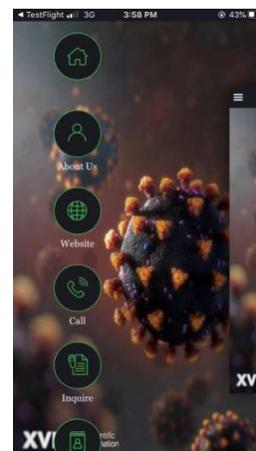


Fig 4. Proposed Interface Design for the Application

The interfaces of the application are developed by android and the database is by MySQL version.

The testing process is very crucial for application development and a proper process will follow to test the application development process and final readymade application before the launch.

No.	Requirements	Typical Components	Description
1.	Scope	Test Strategy Execution Strategy	This test plan describes the testing approach and overall framework that will drive the testing of the application.  Test Strategy: rules the test will be based on, including the givens of the project e.g.: start / end dates, objectives, assumption etc. A production-ready website is the final product of this phase.  Execution Strategy: describes how the test will be performed and process to identify and report defects, and to fix and implement fixes.
2.	Assumptions	Production like data required and be available in the system prior to start of Testing	Exploratory Testing would be carried out once the build is ready for testing.  Tests if the information shows correctly online and, in the reports, it will be assuming that the filtering code segments are working properly.
3	Deliverables	Test Plan Functional Test Cases	Show stopper defects with temporary fix using which continuation of test execution and the same need to be re tested when it arrives in the build.  Performing a test for that feature once to ensure no critical bugs because of code change.
4	Methods	White-Box Testing and Manual Testing	In this phase, system will be test repeatedly to detect errors and bugs. In addition, it will check whether the code fulfills the user requirements. Detecting errors in this phase will lead to reduce or nullify errors in final output of the application. There are number of techniques to test the product such as black box testing, white box testing, functional testing, unit testing, etc. This product mainly tests under white box testing method and usability testing method. White box testing is testing the whole project with the detailed investigation about internal logic and code structure. After completing white box testing, product is test under the usability testing method by distributing the product within a small group of people. It gives more dynamic and effective results than other technique methods. Good testing methods will lead to high quality output.

Table1. Application Testing Process

#### IV. CONCLUSIONS

Ubiquitous computing is the most appropriate method to wireless communication and it could use to find a solution for to get information about the COVID-19 infection rate, affected people around the world, information as a country, news alerts, quarantine details, prediction information, etc. A well-developed ubiquitous application can provide a solution for this. Separate search and access for the information are easy through the social media platforms and this proposed application enables to

combine all those platforms and provide well summarized and most related results for searches. The Covid-19 infection information is very crucial for the world during the present and all the people interest to know more information about the infection, infected rate, experience from infected patients, precautions, herbal medicines for the infection etc. This application provides the best solution for that and the Geo-location tracking facility enable the users to access data in different locations. The NFC technology facilitates for the users to access the information without internet connection and share that information with others by emailing, messaging etc. This application is not just a data retrieving based and it can be classified as a service for the users by enabling alert about Covid-19 and a better procedure to exchange the details about the Covid-19 experience with others even in county-wise. The graphical and structured based analysis by the Google forms facilitates the user to get a clear idea about the infection and the extent of risk for the society as well as for them. The systematic and sequential application development process is followed and the Agile Scrum methodology enables the progressive establishment of application. The testing methods of the application provide the opportunity to reduce bugs in the development. This development is significant due to the reason of using more technological standards like social media platforms, FMC technology and Google forms for data searching, retrieving, filtering and finalize the result.

#### V. RECOMMENDATIONS

Even though the development is successful, the considerably more time will take to data process and filter the information and it is an issue that effects for the application performance. More time consumption for data processing and finalize the result, will negatively affect the practice of application by the user and user could leave the application with a negative intention. A proper methodology should implement to solve this issue in future work. The notification alerts for the

application is crucial to maintain good performance a notice the users about new updates about the infection. The proposed application is not providing notification alert facility and with the future development, a new technological method should launch to notify the users with new updates. The fake information could pop up with the searches of social media platforms and Google. A recommended method should implement to filter the correct information through the application and user voting or a system to confirm the information whether its correct or not, will provide a solution for this. With future work, it's better to attach a voting system or an information confirmation system to minimize the pop up of fake information in the application. If the user will able to make an account, log in to the application and timely update the photographs, videos and other information to a common page, it will be far way better to exchange and share the information with others. As the future work, this facility will launch and the database storage will enhance to store huge amount of data.

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