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| **Abstract:** | This document contains a discussion on development of AI tool for Health using Mobile Applications & Cloud-based AI applications. This document also invites Medical & AI researchers to collaborate in development of Cloud-based / Mobile Application based AI tools for Health within the International Telecommunication Union (ITU)/World Health Organization (WHO) Focus Group on “Artificial Intelligence for Health” (FG-AI4H). |

**Introduction:**

The use of AI in Mobile Applications is growing rapidly [1]. Its use in resource-poor countries is relatively less as compared to developed countries [2]. The healthcare mobile apps have a significant positive impact on health and health care [3]. The cloud-based AI services have enabled users to access their health information from anywhere, anytime [4]. The cloud-based AI services have reduced the cost, manpower and paperwork [5][6][7]. The Cloud based Applications and mobile apps have a significant positive impact on health and health care, however, there is a need to discuss on technology, security and legal issues related to these applications [8]. There is a wide scope for development of Cloud-based & Mobile Application based AI tools for healthcare within the sphere of International Telecommunication Union (ITU)/World Health Organization (WHO) Focus Group on “Artificial Intelligence for Health” (FG-AI4H).

**Objectives:**

The objectives of the topic groups are as follows:

1. to discuss the development of AI tool for Health using Mobile Applications & Cloud Applications;
2. to provide a forum for open communication among various stakeholders;
3. to coordinate the benchmarking process in collaboration with the Focus Group management and working groups.

**Key features required for development of AI tool for Health using Mobile Application:**

The desired key features for development of AI tool using mobile application are that it should attract the attention of the user, serve the desires of the user and develop the faith of the user with the tool. Some desirable features/ rules may be followed as detailed below:

1. Simple Registration [9]:

Registration may be kept as simple as possible. Login may be allowed with user’s existing Facebook/ Google ID/ similar system.

1. Minimal Introduction [9]:

The introduction should not be imposed on the user. However, complete introduction may be provided on demand of the user.

1. Training/ Instructions [9]:

The user should be informed about the importance of the data required for the working of the AI tool before collection of data. The user must be explained why permission to access the camera, geolocation or similar features of mobiles are being asked.

1. Simplified user interface [9]:

All the features which are available in the desktop website version of an AI tool should be intelligently made simpler and key functions of the tool.

1. Functionality [10]:

The mobile applications should be developed keeping in view the desired features of application, target audience and the distribution channel such as Google Play, Apple App store etc. Some key points are as follows:

* Verify accessibility in respect of compatibility with mobile platforms, user friendly language, easy to use and affordability
* Confirm that mandatory fields are being collected, format of data and display of data is correct
* Proper error handling and relevant error messages
* User-friendly console of the App, appropriate size of the buttons and user manual for users
* Collection of text information should be minimized and use of checkboxes/ radio buttons should be increased.
* The font size should be clear enough to read and to select the desired option

1. Performance [10]:

Some key points for validation of the performance of mobile applications are as follows:

* The client server communication should work properly at peak, average and minimum user levels
* Identify the bottlenecks which prevent the application to perform at the required acceptability levels.
* Identify optimum response time of the app
* Identify the optimum mobile device requirement for the app
* Identify optimum performance of resources such as GPS, Camera, Battery etc in various situations

1. Security Validation:

The security of mobile applications should be validated. Some key points are as follows:

* Enforce secure communication by applying signature-based permissions, disallow access to your app's content, ask for credentials before showing sensitive information etc. [11]
* Apply network security measures by using SSL communication, applying network security configuration and creating your own trust manager [11].
* Use the best Cryptography Tools and Techniques [11].
* Get security audit of Mobile App
* Design App for handling data overflow
* Privacy policy should not be copied
* SDK may be used in place of NDK
* Encryption Key of at least 128 bits may be used

1. Positive Discontinuation [9]:

If a user wishes to discontinue the use of AI tool, he/she may be allowed with clear guidelines on how to discontinue and with a simple feedback procedure.

**Types of Mobile Application:**

Details on various aspects of the Mobile App are available online which can be studied before planning to design a Mobile App [12][13][14]. Summarizing, the Mobile Apps can be classified as following based on the functionality of Apps:

1. Native App: The App that has been developed and distributed to run on a specific platform, can take advantage of the platform and can be distributed and updated via an app repository associated with that platform.[12]
2. Web based App: Websites which are created to look like a native app, but it actually run at a web browser software running on a mobile.[12]
3. Hybrid App: These are the apps which are installed as a native app; however, their functionality is delivered from a web browser. These apps have the richest functionality as compared to above two type of Apps.[12]

The Mobile Apps for health can be further classified as follows:

1. Health Awareness Apps: These apps are developed to provide awareness about a particular disease.
2. Apps with associated medical devices: These apps are being used as diagnostic tools and designed to serve for a specific test.
3. Apps for disease surveillance: These apps are commonly being used by research organisation to know the burden of the disease. They contain objective specific standard questionnaires to know the prevalence of a disease or any problem relation to treatment seeking behaviour of the patients.
4. Apps for volunteers willing to join a health survey: These apps are commonly being used by many organisations to collect information from volunteers to achieve a specific goal.

**Designing of dynamic Apps:**

Most of the health research issues have similar pattern of questionnaire or activities. By identifying the common pattern of health surveys and issues, a simple database can be designed at a webserver. This system found to be very useful to prepare App quickly by making minimal changes in the system. By simply making changes in the database in the webserver the mobile app can be updated for the desired requirements.

The details of some research projects being carried using above mechanism are follows:

1. In the project entitled “Targeted Intervention to Expand and Strengthen TB (TIETB) Control in Tribal Populations under the Revised National Tuberculosis Control Programme, India” a mobile app and a PHP-MySQL based webserver is developed. Using mobile App Data collected from TB Patients, Contact of TB Patients, Community Persons, Health workers and Medical Officers from Tribal Areas of 17 Districts of India, 35 Mobile vans equipped with Digital X-ray and sputum microscopy services were launched in 2017-2018.
2. In the project entitled “Development of an IT based Leprosy and TB Patients monitoring system in order to ensure complete treatment of the patients”, an Interactive Voice Response System (IVRS), SMS System and cloud based system was developed to study the efficacy of IT based technology on treatment adherence in Leprosy and TB patients
3. In the project entitled “Screening and Early Detection of Cervical, Oral and Breast Cancer in Cachar, Assam”, a mobile App based system is developed. 250+ health workers were trained for conducting survey using mobile App and surveyed 46,000+ population and identified 4400+ suspected cases.
4. In another project Screening of families of workers of Tea Garden was conducted to identify risk of Non-Communicable Diseases and early detection of Cancer in Dibrugarh, Assam. Health workers of that area are trained, surveyed 9600+ population and identified 1200+ cases at high risk of Non-Communicable diseases.
5. In the project entitled “Prevalence of fluorosis in the community of selected districts of India and development of an appropriate intervention model from prevention and control of fluorosis” a cloud based system is developed and surveyed 50000+ population from 7 districts of India.
6. In the project entitled “Programmatic Implementation and Comparison of MIP Vaccine Immunoprophylaxis and Rifampicin Chemoprophylaxis for Contacts for Leprosy Patients under the National Leprosy Eradication Programme (NLEP) in High Endemic Settings”, a mobile application based system is developed and surveyed 17000+ families population
7. In the project entitled “Prevalence and Determinants for TB Disease among Contacts of TB Patients: A Bi-directional Study”, a mobile application based system is developed and surveyed 70+ cities.
8. A randomised controlled trial is being carried to compare the efficacy of mobile app vs conventional prescription of analgesics and adjuvants’ adherence on selected variables among cancer patients receiving palliative care at a tertiary care centre.
9. A mobile application based system is developed for digitization of Process of Assigning medical cause of death process

**Result:**

Dynamic Apps are prepared and their design depends on the database of the main server. Dynamic nature of mobile application makes updating easier. The data synchronisation procedure becomes simple. Data analysis becomes more powerful

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