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Mobility Report

Dr. Dost Muhammad Khan

Visit of The University of West of Scotland

July 29 to August 02, 2024



Name of Participant: Dost Muhammad Khan

Affiliation: The Islamia University of Bahawalpur, Pakistan

Host Institute: The University of West of Scotland

Visit Dates: July 29 to August 02, 2024

Title of the Project: Sensing, Artificial Intelligence and Edge Networking towards Rural Health Monitoring (SAFE-RH)

Erasmus+ Project Reference Number: 619483-EPP-1-2020-1-UK-EPPKA2-CBHE-JP

I participated in the SAFE-RH meeting and training session at the University of West of Scotland, UK, from July 29 to August 02, 2024, as a key member of the project team. This event provided a platform to present, evaluate, and discuss the project's overall progress, challenges, and key deliverables.

During the meeting, I delivered a presentation focusing on the following key aspects of the project:

1. Establishment of SAFE-Rural-Health-Technology Lab.

Following are the key features of the SAFE-RH Lab:

- i. Implementation and assessment of remote health monitoring framework in Pakistan.
- ii. Lab will provide a technology transfer interface between Europe and Asian partners.
- iii. Technological advancements made by the European partners will be assessable through Lab in Asian partner countries, to upgrade their conventional rural health practices.
- iv. Dedicated Lab for Dissemination and Training of Medical staff.
- v. Lab is equipped with all three pilots.
- vi. Developed for remote area where availability of internet and electricity is scarce.
- vii. This system can work in no connectivity areas to gather patient's data.
- viii. Collected data can be uploaded to MIS later as soon as internet is available.
- ix. Doctors and paramedics are the only user for this application.

- x. This application can connect to BT Medical devices for collecting patient vital signs.

I along with Dr. Najia Saher and Dr. Muhammad Suleman, we also presented the updated status of fund utilization and the project budget to Prof. Naeem Ramzan. During the discussion, Prof. Naeem emphasized the importance of utilizing the project budget effectively within the allocated deadlines to avoid any financial discrepancies.

Additionally, I actively assisted the students involved in the project with the installation of all relevant devices for testing and demonstration purposes, ensuring that all technical components were functional for the project's ongoing research and development activities.

Overall, the meeting proved to be highly productive, fostering stronger collaboration with both international and local partners while significantly advancing the objectives of the SAFE-RH project. It provided valuable opportunities for knowledge sharing, problem-solving, and aligning efforts toward achieving the project's key goals.



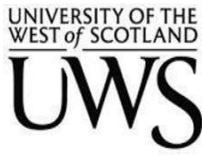
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Dr. Najia Saher

Visit of The University of West of Scotland

July 29 to August 02, 2024



Name of Participant: Najia Saher

Affiliation: The Islamia University of Bahawalpur, Pakistan

Host Institute: The University of West of Scotland

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1. Quality Audit Report

The Quality Audit Report for the SAFE-RH project outlines a strategic framework designed to ensure the highest standards of quality across all project activities and deliverables. The aims and objectives of the QAP are detailed as follows:

- To maintain and continuously improve the quality of all project deliverables, ensuring they meet or exceed predefined standards.
- To define clear and measurable quality standards for all project activities and deliverables, including training programs, technological implementations, and healthcare services.
- To create a culture of continuous improvement where feedback is actively sought and utilized to refine and enhance project activities and outcomes.
- To create a system of accountability where all project stakeholders are responsible for adhering to quality standards.

By focusing on these aims and objectives, the Quality Assurance Plan for the SAFE-RH project seeks to ensure that all aspects of the project are executed with the highest level of quality, thereby significantly contributing to the overall success and sustainability of the initiative.

The following are the Quality Audit (QA) of different components of project:

- QA of deliverables
- QA of project meetings
- QA of SAFE-RH training/events
- QA of SAFE-RH electronic media including website
- QA of SAFE-RH promotional material
- QA of SAFE-RH project management

2.Training Module: Introduction to Basic ICT

This module mainly targets to paramedics and patients with an assumption that they are very little or somewhat familiar with the IT concepts.

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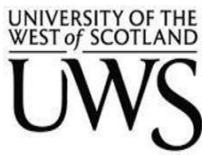
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Dr. Muhammad Suleman

Visit of The University of West of Scotland

July 29 to August 02, 2024



Name of Participant: Muhammad Suleman

Affiliation: The Islamia University of Bahawalpur, Pakistan

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During the meeting, I delivered the following key aspects of the project:

1. SAFE-RH Offline Management Information System (MIS)

SAFE-RH Offline MIS is an executable application of online MIS. This offline application works as stand-alone system in some desktop/laptop in some health care vicinity. This offline MIS don't have capability to create new account for doctors and paramedic staff due to security concerns. These accounts create in online MIS and required to sync for offline availability. Similarly, all data of patient, illness record and sensor data is required to sync with online MIS. To perform this two-way synchronization, Stream-lit Data Sync application created. Following are the main objectives of the development of Offline MIS:

- Developed for remote area where availability of internet and electricity is scarce.
- This system works in no internet deprived areas to gather patient's data.
- Collected data is uploaded to MIS later as soon as internet is available.
- Doctors and paramedics are the only user for this application.
- This application connects to Bluetooth (BT) Medical devices for collecting patient vital signs.

This system is designed so that it can locally collects and stores walk in patients' information, it can be later transmitted to SAFE-RH Online MIS system. This system plays a critical role in ensuring efficient and effective patient care by providing healthcare professionals with timely and accurate data, catering to environments with limited or no internet connectivity.

The offline system is designed to replicate the comprehensive capabilities of the online MIS. Key functionalities include:

- i. **Data Collection:** The data is collected with sensors and input methods to collect a wide range of patient data, including vital signs, medical history, and ongoing treatment details.
- ii. **Data Storage:** The system securely stores collected data locally, ensuring that patient information is preserved even when internet connectivity is unavailable.
- iii. **Data Transmission:** Once connectivity is restored, the system facilitates the seamless transmission of stored data to the central SAFE-RH information system, ensuring data synchronization and integration.

The offline system offers numerous advantages, particularly in challenging healthcare environments:

- i. **Continuity of Care:** By enabling data collection and storage without the need for constant connectivity, which ensures that patient care continues uninterrupted.
- ii. **Accessibility:** Healthcare providers in remote or underserved areas can access and manage patient information effectively, improving the overall quality of care.
- iii. **Data Integrity:** The system's ability to store data locally and synchronize with the central system maintains the integrity and completeness of patient records.
- iv. **Scalability:** The offline system can be deployed in various healthcare settings, from Rural Health Centre RHC and Basic Health Unit (BHU), providing a scalable solution for diverse needs.

The Offline MIS system represents a significant advancement in patient management systems, particularly for environments with limited connectivity. By replicating the functionalities of the online MIS and integrating seamlessly with the SAFE-RH information system, the Offline MIS system ensures that patient care remains efficient and effective, regardless of internet availability. This innovative solution underscores the importance of adaptability in healthcare technology, offering a reliable and scalable approach to managing patient information in diverse settings.

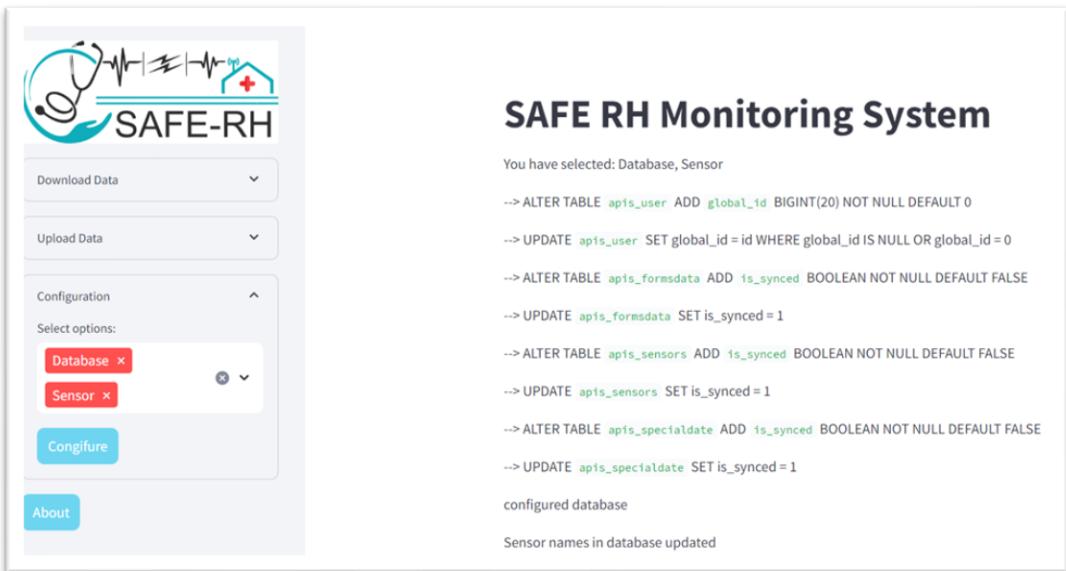


Figure 1: Screen Shot of Data Syncing App

2. Integration of SAFERH Sensing Devices with Offline MIS

SAFERH Sensing Devices use blue tooth to transmit data to other devices. IUB have to develop an application that provide an interface between devices and the offline MIS. SAFERH Sensing Devices are a bunch of devices including temperature, spirometer, pulse oximeter and many more.

```

C:\WINDOWS\system32\cmd.  +  -
D:\safeRH\SafeRH_123\AndesFit_Agent>python AndesFit_Agent.py
Device name: IUB_001
Devices info: {'TEMP': 'FD:62:58:02:4C:07', 'BLE-MSA': '34:14:B5:45:13:85', 'Medical': 'F7:7A:C4:B4:C5:00', 'BPM': 'FD:62:58:01:00:44', 'SDIC': 'A4:C1:38:CF:14:15', 'Samico GL': 'C6:2D:14:00:F0:5F'}
  
```

Figure 2: Console of Interface that shows the list of connected Devices

This console application just a verification for operator while actually this application also put this data in offline MIS database and later this data will be available to display on MIS interface.

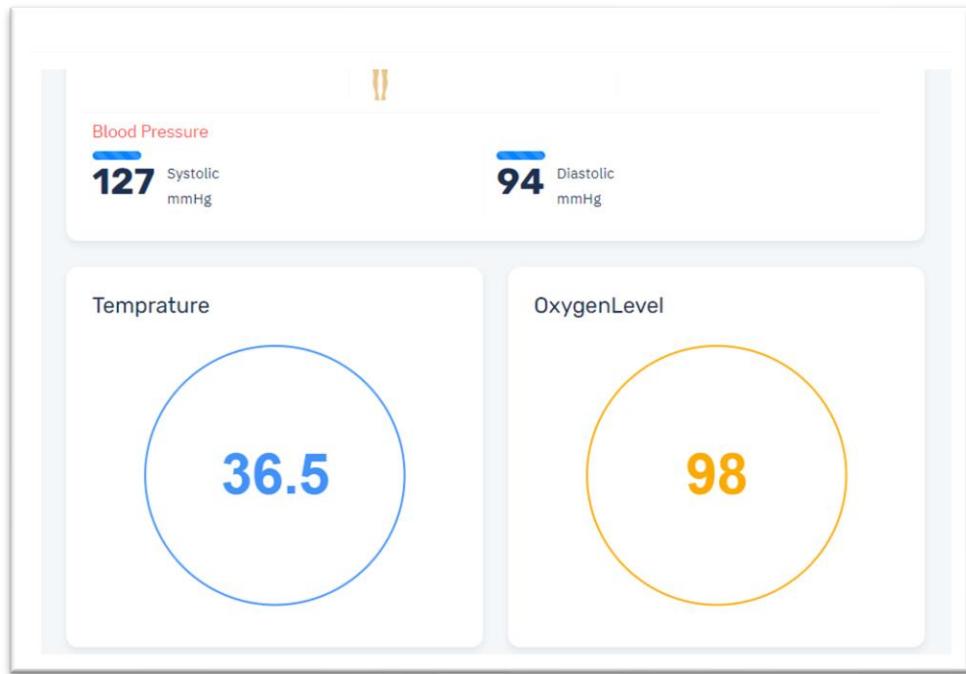


Figure 3: Readings from Devices

3. Raspberry Pi and SAFERH Sensing Devices

For patient data collection in remote areas, IUB also develop a Raspberry Pi based module that get readings from SAFERH Sensing Devices and display on simple matrix display attach to Raspberry Pi. Raspberry Pi also transmits this data to online MIS.

First, a Raspberry Pi machine setup with matrix display and communication modalities of WIFI and Bluetooth. SAFERH Sensing Devices transmit their readings to Raspberry Pi using BT and Raspberry Pi transmit this data over the network and pre-configured MIS.



Figure 4: Raspberry Pi with Matrix Display and Communication Module

4. Infant Monitoring Pilot

Patient Monitoring Patch (PMP) shown in Figure 5 is developed for collection, storage, and transmission of patients' information. A patch is developed to collect body temperature, SpO2, pulse rate and environment temperature and humidity etc. Patch collects target patient's credentials and transmit it to remote online MIS server.

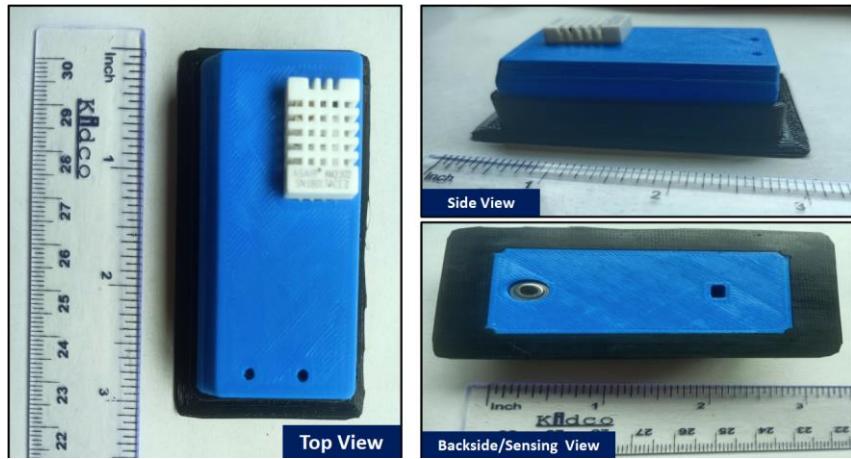


Figure 5: Patient Monitoring Patch

The patch needs WIFI connection to connect to server. A mobile application (shown in Figure 6) is used to set SSID and Password so that in future patch can be connected to network. Another application (shown in Figure 7) is used to set device name and monitor data gathering.



Figure 6: WIFI_CREDENTIALS

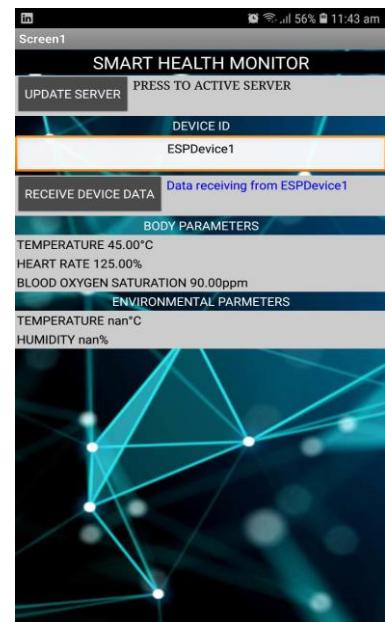


Figure 7: UDP_SERVER

Patient Monitoring Patch readings are not very accurate and stable and needs improvement. For

these reasons, it is not deployed with SAFE-RH Online MIS system and SAFE-RH Offline MIS system. SAFERH Sensing Devices are used to gather patient data. Details of Patient Monitoring Patch is available at [Smart Healthcare Patch/Band.](#)

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