# Sub-project 2: "Experimental development of emerging technologies in the field of mobile communications at the level of online social networks and study of their impact at the level of users" (Integrated Mobile Social Networks)

## - Sumary 2019 -

### Activity 2-2-1: Formulation of functional and non-functional requirements of the mobile subsystem

In this activity we have stated the functional and non-functional requirements of this subsystem. They are of major importance in the creation of the FutureWeb online social network, being the foundation from which the design and construction of the project begins. Functional requirements were stated on the basis of qualitative research carried out within this project, using the focus group method applied both on individuals and business people. As a general conclusion, participating individuals do not frequently use IoT (Internet of Things) technologies, nor do they know the tools to use them in online social media. As far as the business environment is concerned, it can be said that IoT technologies have a low level of involvement at the company level, as well as for the foundation of decisions and strategies. It can be concluded that organizations have official accounts on social media, the most widely used being Facebook. They routinely use online social networks for communication and promotion purposes. Basic concepts for messages, user page, web pages, recommendations and statistics have been developed.

Non-functional requirements define the criteria and properties that the FutureWeb platform must meet. They may be more critical than functional requirements because if the platform is not met it would not work as designed and would not be useful. Below are the main non-functional requirements of the platform: web design, system performance, security, extensibility, maintenance and administration, availability, usability, SEO and statistics.

**Deliverable:** ***Study 1***

**Activity 2-2-2: Development of an experimental mobile subsystem model (prototype) within the FutureWeb platform**

Mock-ups have been made in the ADOBE XD program, for mobile, proposing several possible models.

In this respect, two applications have been proposed – one to monitor the pulse, the number of steps and another to monitor the air quality in the classrooms/training. The first app is made for Samsung Gear S2 smartwatches and will transmit information while worn by the user. All this information will be available to each user on the personal FutureWeb page.

The second application is for air quality measurement devices that collect data such as temperature or humidity. All data is transmitted to the Cloud and so analyses/correlations can be made between air quality and the level of attention/involvement of students in classrooms/studies.

**Deliverable:** ***Study 2***

**Activity 2-2-3: Testing the prototype by analyzing user behavior, based on the emerging concept of IoT (Internet of Things)**

The methodology of research in the field of IoT consists in theoretical principles, methods and techniques for data collection, methods and techniques for data analysis and their implementation component. Usability testing was carried out in several stages to see if there are any difficulties in carrying out operations/orders.

Testing the prototype by analyzing user behavior for IoT air quality monitoring technologies in the study rooms involved three qualitative researches. All three studies included: developing a test plan (testing purpose, objectives), setting the environment and ambience in which the tests will be carried out, research methods, selection of participants, information collection, analysis of data and observations. The results of the three studies were presented in the final document relating to this activity.

**Deliverable:** ***Study 3***

**Activity 2-2-4: Prototype testing by analyzing user behavior, based on the emerging concept of wearables (portable devices)**

The performance of usability tests based on the emerging concept of wearables (portable devices) are necessary for:

- analysis of behavior and flow related to the FutureWeb platform and IoT devices: spontaneous use, possible hesitations or possible errors;
- understanding user behaviour and analysis of the flow in use;
- assessment of weaknesses and strengths;
- recommendations to improve the system and implement the necessary changes.

Testing the application's usability for heart rate monitoring and step count involved several steps: the purpose of testing, the objectives, the location of the tests, the test methods, the selection of participants, the preparation for tests, the collection of information and data analysis and observations.

Three studies were carried out for several categories of possible users, from which the conclusions, presented in the final document relating to this activity, were drawn.

**Deliverable: *Study 4***

**Activity 2-2-5: Making specifications to improve the system and implement the necessary changes**

Following case studies and semi-directed interviews, several specifications for the improvement of both the IoT (Internet of Things) system and the emerging concept of wearables (portable devices) were drawn.

Air quality monitoring devices were generally used easily, but different difficulties arose during the testing. These technical problems, both at the hardware and software levels, have been detected, analysed and improvements have been proposed. In order to avoid technical failures, it has been established that in the future these IoT devices should be closed within a box. IoT devices must be connected to the power grid in a place away from heat sources or in places where they are not subject to certain extreme temperature conditions. Users involved in the study were generally interested in data from IoT devices, indicating other information that would interest them – such as CO2 information, to know when to ventilate the room or use an air purifier.

Study users were already users of smartwatches. However, they encountered difficulties when the mobile phone had the battery completely discharged. After the battery was charged, the app had to be restarted and the Connection via HotSpot was set again. This caused difficulties because, although the phone's battery was charged, the

smartwatch did not connect to it. After this incident, both the watch and the mobile phone must be constantly checked so that the battery does not fully discharge and is charged in time. The watch used for studies is downloaded relatively quickly, so whatever activity must be loaded daily. If one of these downloads, users need to know clearly what the app's reboot steps are – these steps need to be mentioned, written down, and also be an available person to answer their questions at any time.

It is also recommended to improve the procedure when the connection between the watch and the mobile phone is lost. After the battery was charged, the app had to be restarted and the connection via HotSpot was made again. This caused difficulties because, although the phone's battery was charged, the smartwatch did not connect to it. The app will be modified so that users can connect faster. At the same time, all the steps necessary for this operation are noted in writing, so that certain operating errors can be avoided.

All improvement specifications were mentioned in the final document of this activity.

**Deliverable: *Study 5***

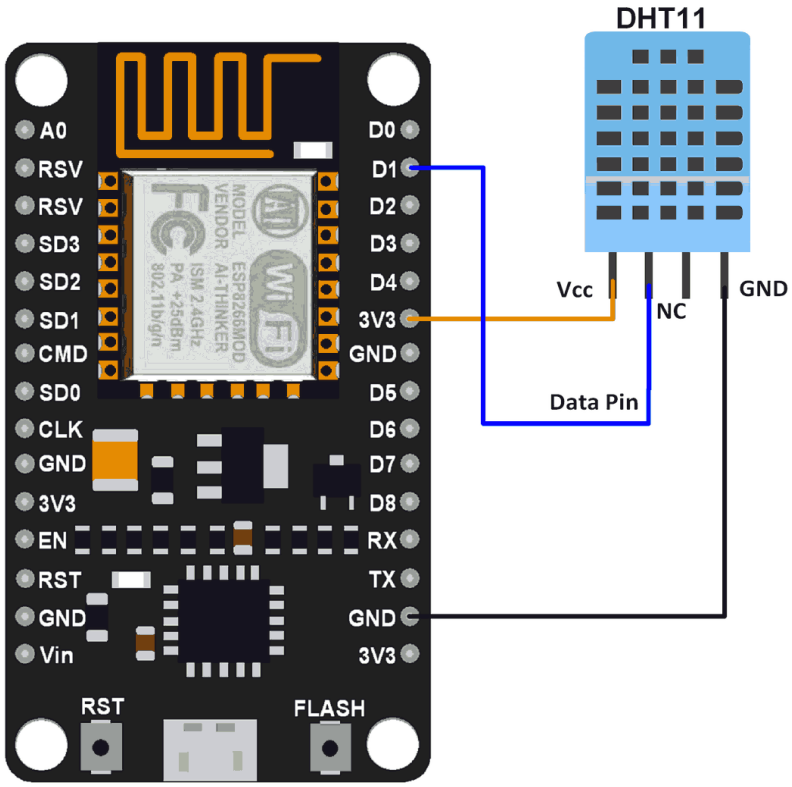
**Activity 2-3-1: Construction of the IoT section of the subsystem**

The first challenge was to develop a device capable of capturing data from study rooms and transmitting it, using the Internet, to a central platform to manage the data collected and make available, filtered data, to the FutureWeb platform.

For this, several objectives have been achieved:

- Identification of moisture and air temperature coefficients
- Repetitive pickup and sensor input data processing
- Transmission of data over the internet
- Centralized database data collection
- Set up your device to connect dynamically and automatically to Wi-Fi networks using data stored in EepROM memory
- Selective separation and identification of data collected by sensor identifiers
- Making data available through an API
- Display API data in filtered manner
- Project documentation and integration with third parties.

The diagram of the sensor connection with the hardware controller module can be




observed in the following scheme:

The collected data is presented and updated automatically on the FutureWeb platform in a simple and easy-to-access form. On the right side of the user panel, the following data will be presented: the temperature and humidity in the study rooms and the exact time of data collection.

The second challenge was to use a Samsung Galaxy S2 smartwatch to periodically analyze sensory data and communicate it centrally to the data processing and analysis platform.

For this, several objectives have been achieved:

- Repeated pickup of the carrier's pulse value
- Repeatedly take the number of steps taken since the clock is done
- Automatically, repetitively transfer to the data centralization platform
- Selective separation and identification of data collected by sensor identifiers
- Making data available through an API
- Display API data in filtered manner

- Project documentation and integration with third parties.

The hardware used involves the use of Smart Watch devices - wearable, Samsung Gear S2:


The data collected is automatically presented and updated on the FutureWeb platform in each user's personal section. Data such as pulse, number of steps will be presented on the right side of the user panel. WordPress base functionality has been expanded with ACF Pro and CPT UI plugins, both at the management level of custom post types and internal data management and exposure logic.

An API interface has been designed and implemented for the interface between systems that allows both the storage of new information and the exposure of the last collected record or all records collected for the sensor pattern.

In the first stage, data storage was done in the form of meta text information attached to fields defined using ACF Pro, but subsequently, for very long-standing reasons, the way data was collected and exposed via the API was redirected to a MySQL table, related to the tables in the WordPress kernel.

**Deliverable: *Study 6***