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## **D4.3.2 APPLICATION/SOFTWARE DEVELOPMENT**

(ICT Project Manager)

«Report on the coordination activities of the Design and Development of the Healthcare Monitoring system»

Reporting period: 20/09/2018 – 05/12/2018

WP 4 Joint Monitoring System  
project

## **IMPROVING HEALTHCARE ACCESS THROUGH A PERSONAL HEALTH MONITORING SYSTEM**

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<http://www.ehealthmonitoring.eu/>

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## Summary

The deliverable «Report on the coordination activities of the Design and Development of the Healthcare Monitoring system» is part of the project APPLICATION/ SOFTWARE DEVELOPMENT within the frame of WP 4 Joint Monitoring System of the project IMPROVING HEALTHCARE ACCESS THROUGH A PERSONAL HEALTH MONITORING SYSTEM, according to our contract (14/09/2018 – Ref. No: 44959) and is being implemented within the framework of the Programme INTERREG V-A Greece – Bulgaria 2014-2020.

The particular deliverable aims to highlight the activities performed within the period 20/09/2018 - 05/12/2018 concerning the coordination of the project team for the design and development of the Healthcare Monitoring System.

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## 1 Introduction

The deliverable describes the design and development of the Healthcare Monitoring System as well as the preparation of the ICT infrastructure for the installation of the functional prototype of the system, aiming at its utilization in the pilot actions of the project.

The services designed, developed and integrated into the original system facilitate the following:

- Communication of the user (via video) with the medical staff
- Recording the following parameters regarding the health and physical state of the user:
  - Oxygen Saturation Level (SpO2)
  - Heart rate
  - Arterial pressure
  - Glucose level
  - Daily physical activity (number of steps and sleep time)
- the capability reviewing the records of the above parameters from distance
- Automatic detection of deviations from predefined limits for the above parameters and notification of medical personnel
- Keeping and updating the patient's medical records
- Developing personalized medicine for each patient

The services are addressed to chronic sufferers, people recovering post-operatively or in rehabilitation, as well as individuals (possibly elderly) who live independently and need communication or support in their daily needs and activities, especially in the case of people residing in isolated areas and do not have direct access to health services.

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## 2 Strategic objectives

The design of the aforementioned services, as well as the development of the system, focused on two main axis:

- Development of innovative technologies to improve the quality of life of chronically ill patients and to ensure access to health services and medical monitoring for people in need
- Serving the constantly changing needs of healthcare services by ensuring the best experience for the end user

The objectives of the services designed are the following:

- Provision of high-level monitoring and communication services and recording of health parameters (biosignals and physical activity) with precision and reliability
- Development of innovative personalized medicine services
- Ensure the maintenance of medication by chronically ill patients
- Development flexible technology infrastructure to integrate new innovative services in the field of eHealth

## 3 Activities

The activities carried out include all the necessary procedures for the design, development, testing and preparation for pilot operation of the Healthcare Monitoring System and, in particular, all procedures relating to:

- Feasibility study
- Algorithm design
- Design of suitable interfaces, taking into account increased end-user requirements
- Development of the operational prototype and design of platform for health monitoring
- Development of end-user application and application of medical staff (Android based and web based)
- Performance of tests to check the operation of the system

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- Installation of the functional prototype in a suitable cloud infrastructure, for the purpose of its operation in the framework of pilot project tests

## 4 System infrastructure

### 4.1 ICT systems

The information system was developed in a cloud computing environment, aiming at providing high availability on demand services. This option was made to reduce the initial investment required to simplify infrastructure maintenance and significantly reduce costs compared to traditional computing systems. At the same time it presents a series of functional advantages that are analyzed in the deliverable "Healthcare Monitoring System Development". The computer systems used also are further analyzed in the abovementioned deliverable.

### 4.2 Project team

The design and implementation project team consists of persons that cover a wide range of experience and know-how related with the project services. The project team consists of the following:

- Nikolaos Markellos
- Georgios Pistikos
- Vasileios Mitsios
- Sotirios Serdenis
- Sultana Toumpalidou

## 5 Management

This section describes the managerial issues of design and development tasks such as priorities and milestones, deliverables, and time plan.

### 5.1 Priorities

User satisfaction and smooth operation of the system were deemed of highest importance during the design and development of the Healthcare monitoring system.

A vital goal for the project is its completion within the time constraints. In this context, the activities and the corresponding deliverables that have been developed contribute to the achievement of the above objectives and the objectives of the project. In addition, the members of the project team who were involved in the preparation of the deliverables are mentioned.

Finally, the ways of monitoring the progress of the project, the timetable for implementation and some conclusions that have been crucial for the success of the project are presented.

### 5.2 Milestones

The key milestones for the development of the system, as well as their duration, are presented in the table below. Milestones are defined by the various subtasks. Completing the initial activities is a prerequisite for starting new tasks, so it was necessary to set the appropriate dates for the management of the procedures and the timely completion of the project's initial actions.

Activity	Responsible	Timeplan
System's Feasibility Study	Sotirios Serdenis	2.5 months
Healthcare monitoring system design	Georgios Pistikos	2.5 months
Healthcare Monitoring System Development	Vasileios Mitsios	2.5 months
Testing report of the Healthcare Monitoring System	Soultana Toumpalidou	2.5 months
Preparation of the system infrastructure and installation of the pilot test platform	Project team	2.5 months

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### 5.3 Design and development methodology

The methodology used for design and development follows the Design-Build-Test cycle, known also as the Prototyping Model. According to this model, a prototype of the software, including only the basic features of the final version is developed first. Testing of the prototype provides feedback, which can be used to improve the system. This model is useful when it is not easy to derive requirements for the system, or the requirements may change significantly during the development process. The software development process within the prototyping methodology consists of four stages:

- Defining basic user requirements
- Development of the prototype of the system
- Testing of the prototype to redefine user requirements
- Revision and improvement of the prototype

The use of the specific methodology allows for improved design, based on the evaluation of the prototype by users and experts, resulting in the development of applications that satisfy user requirements to the fullest extent.

### 5.4 Monitoring of the activities

The software version of the platform has been updated and is being updated on a weekly basis. The project team Coordinator identified all the activities and processes of the software development phase that were necessary and set the dates for their completion.

In the case of problems, the necessary report was recorded in testing report, a supplementary delivery of the administrative coordination of the project. This report includes a description of each problem that occurred, the date of detection, the person who reported and managed the problem, the solution to the problem, and the date of the resolution. This file was logged by the coordinator and proved to be absolutely useful for the project team cooperation during the initial project phase.



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## 6 Deliverables

### 6.1 Deliverable «Healthcare monitoring system design»

The main deliverable of the project is the design of such a platform that:

- serves for the recording and processing of biosignals of chronic sufferers
- consolidates the communication of the users of the service with their assistant doctors
- supports the maintenance of the electronic medical records and
- in a more general context, ensures the establishment of an innovative eHealth service.

In the framework of the study of this deliverable, all the necessary research on state-of-the-art in electronic medical monitoring services was carried out and the conceptualization of the system architecture and the basic principles of their operation were shaped. The above was the guide for the development of the operational prototype, while development processes led to the design of the system. In addition, strategic changes were made whenever deemed necessary.

### 6.2 Deliverable «Healthcare Monitoring System Development»

In the context of this deliverable, the functional prototype - a health monitoring was developed. At the same time, the development of the biosignals recording and evaluation platform was carried out.

At the beginning, a platform prototype was implemented to facilitate the stress tests and other functionalities' checks. The goal of this time sequence was to optimize the platform before the platform become operational.

Following, the end user application was developed. At the hardware level, a tablet was used, with a built-in camera and software developed in a mobile environment (Android). At the same time, the necessary actions have been taken to make development applications compatible with smartphones. In addition, communication interfaces with peripheral biosignals logging and physical activity recording devices have been developed.

After performing the functional tests and finalizing the specifications, the preparation of appropriate documentation followed.

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### 6.3 Deliverable «Feasibility Study of the Healthcare Monitoring System»

During the reporting period, the system feasibility study was prepared. It is a study that has led to the design of market research, and the individual processes necessary for the smooth implementation of design and development actions. The process of market research is of the utmost importance for the success of the project and therefore it has been deemed necessary to organize it perfectly.

### 6.4 Deliverable «Testing report of the Healthcare Monitoring System»

Along with system development processes, testing of the functionality of the individual subsystems was performed continuously, for the early identification and correction of errors and failures in the implementation. The relevant deliverable describes the methodology followed for conducting the tests as well as the results of the process.