ITEA 3

Personal Healthcare Empowerment

Deliverable 3.1

SYSTEM REQUIREMENTS SPECIFICATION

WP3 – Coaching Framework,
T3.1 Technical Requirements for Coaching Platform

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Glossary

Acronym	Meaning
%	per cent
&	and
BMI	Body Mass Index
CEP	Complex Event Processing
COPD	Chronic Obstructive Pulmonary Diseases
CORD	Chronic Obstructive Respiratory Diseases
CRUD	Create Read Update Delete
D	Deliverable
DCA	Data Collector and Analysis
etc	Et Cetera (Latin: And So Forth)
FPP	Full Project Proposal
FUN	Functional
HW	Hardware
I	Interoperability requirements
ID	Identification
KPI	Key Performance Indicator
KR	Key Result
M	Month
Mgt	Management
ms	milliseconds
NFR	Non-Functional Requirement
PHE	Personal Health Empowerment
Pr	Privacy requirements
QoS	Quality of Service
Re	Reliability requirement
SW	Software
SW	Security
T	Task
T	Technical requirements
ToC	Table of Content
U	Usability
URL	Uniform Resource Locator
V	version
WP	Work Package

EXECUTIVE SUMMARY

The objective of this deliverable is to define, describe and compile all the functional and non-functional requirements that the coaching system needs to meet.

These requirements were based on the Key Results, as defined in the FPP, and all the information extracted from WP1. Thus, all the requirements gathered in this deliverable were elicited after understanding the current market situation and the needs willing to overcome.

The structure of D3.1 is quite similar to D2.1. The same elicitation process, categorization and naming structure was followed, and it is explained again in section2 - Requirements Elicitation Process.

Section 3 presents the Key Results that are expected to be achieved according to the FPP together with the KPIs designed to measure its success. All this information was used as reference not to mislead PHE original goals. In addition, all the research carried out in WP1 was used to define in detail the design of the Coaching Platform in order to obtain an attractive and innovative solution.

Section 4 lists all requirements identified first as functional and second as non-functional. Together with the description of the requirement, each one was assigned a degree of importance and priority to guide us when structuring the development.

Finally, section 5 presents identified constraints that will be taken into account as potential risks during development. And Section 6 concludes by listing all the requirements described to date, those from the monitoring and analysis module and those from the coaching platform. This list quotes which use case addresses each requirement and is ranked by priority and importance.

1 Introduction

Rising costs of healthcare due to the ageing population and related increase of non-communicative diseases urges for finding ways to save expenses by diminishing the need for care and making the current care more efficient. At present, healthcare provision is reactive, and process driven, treating patients according to predefined pathways with limited possibilities to consider the individual needs or abilities. Health authorities and care providers are finally noticing the one resource that had remained unused – the person or patient him/herself! By starting with the primary need of the person – to be healthy – and including him/her into the process in an active role, new paradigms for care become possible. Significant cost reductions can be achieved by preventive solutions to help the person adopt a healthy lifestyle – thus reducing the number of patients – and by providing the person with tools to actively participate in the treatment when diseases do arise – thus decreasing the burden on care personnel.

The main goal of this proposal is to empower people to monitor and improve their health using personal data and technology assisted coaching.

Developments in technology have enabled the empowerment of people for self-care more than ever before. Smart phones and tablets and quantified self-style self-monitoring wellness devices are commonplace. Wellness oriented solutions often suffer from short-term use due to quickly diminishing interest from their users and from lack of possibilities to utilise them in conjunction with clinical healthcare treatments. Patients are left alone with their problems in between therapy or treatment, and the possibly collected personal data is left unused.

Innovations in the project are expected in;

1. analytics on heterogeneous personal health sources to provide insight in the relation between behaviour and health
2. methodologies to develop interactive, dynamic and personalised coaching programmes
3. modularisation of a scalable coaching framework
4. innovative motivating approaches for long-term adherence
5. innovative business models for preventive

The Personal Health Empowerment project aims to achieve significant cost reductions for preventive solutions to help the person adopt a healthy lifestyle and providing the person with tools to actively participate in the treatment when diseases do arise by empowering people to monitor and improve their health using personal data and digital coaching. As a result, these will be causing to reduce the number of patients and decrease the burden on care personnel.

The results of the project include:

- Innovative technologies for vital signs, activity and behaviour monitoring
- Personal health analytics and visualisation tools
- Methodology and tools for the development of interactive and dynamic coaching programs (content & functionality)
- A modular reference framework for coaching application development and deployment

- Motivating self-care applications
- Validated pilot with users in the target groups for lifestyle management
- Exploitation plans for partners including go-to-market plans with disruptive business models

The project innovations will have a large impact on healthcare provision in the future, providing both evidence and means to realise people-centric and preventive health care, and allow for cost-saving solutions with increased patient involvement. It will address societal challenges including ageing, rising dependency ratio, lifestyle-related diseases, and healthcare efficiency to provide care in a more personalised and efficient way.

1.1 Deliverable Scope and Objectives

All the work carried out in WP1 and gathered in D1.1: Use Case and Requirement specification and D1.2: Preliminary market analysis & Business Plan Specification, was used as a basis for further detail definition of the requirements that the Coaching Platform will need to comply in order to provide innovative and enriching services to our future users and customers.

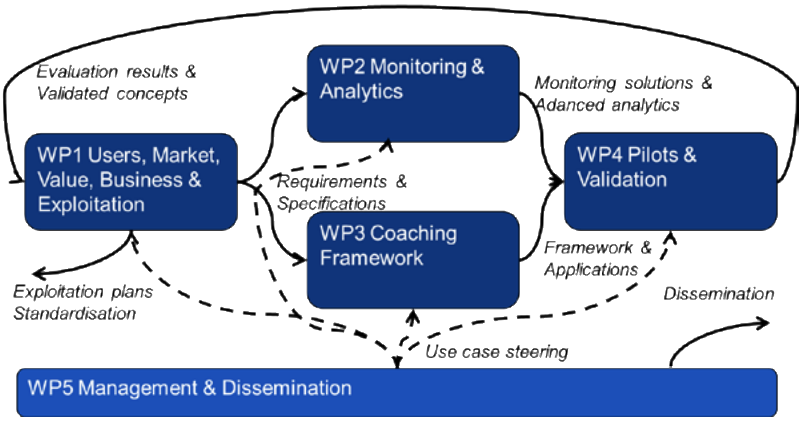

Figure 1: PHE WPs Interconnections

2 Requirements Elicitation Process

The purpose of requirements elicitation is to identify business needs associated with a developing system (PHE) and define related and quality requirements that can be implemented into the software definition. In summary, "*A well-formed requirement is a declaration of system functionality that satisfies client needs*"[1].

In Figure 2 the framework for the requirements elicitation is shown. The first step in obtaining requirements is to have a complete and precise vision of the target market. It is therefore essential to understand the needs of the business and how to provide an answer or solution. Secondly, the right stakeholders should be involved during the project lifetime in order to fine-tune the requirements.

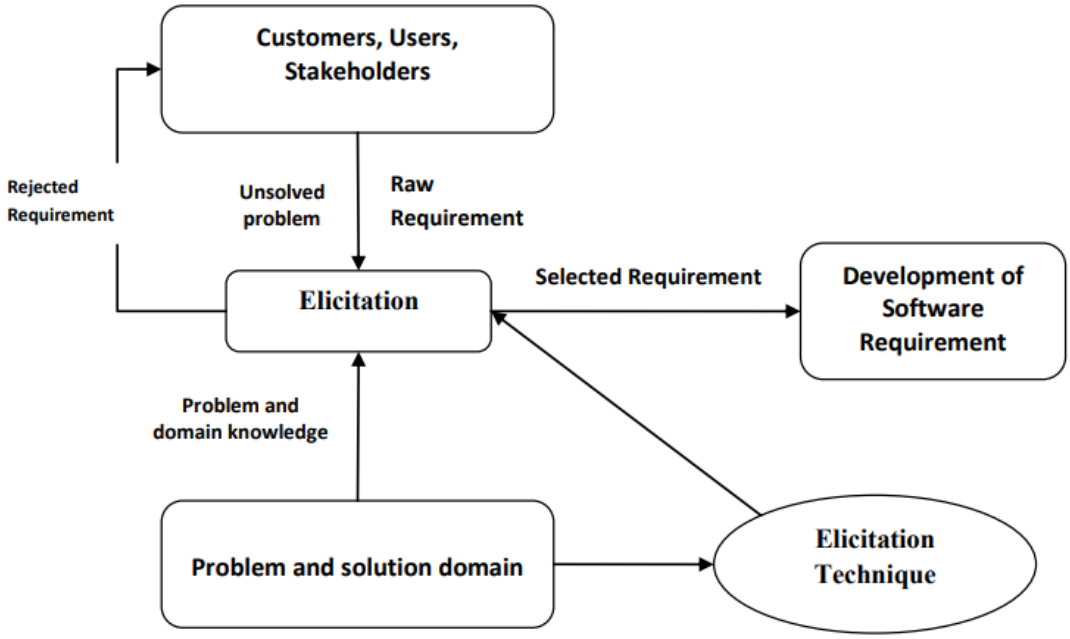

Figure 2: Framework of Elicitation[1]

In terms of methodology, the requirement elicitation techniques used are listed below:

- Interviews with future customers and other stakeholders to enrich the information necessary for the development of the project.
- Set of Use Cases where PHE solution will be validated. This use cases describe how the users will interact with the system, focusing on what the users intend to obtain from PHE solution.
- Brainstorming when defining requirements for each use case, and then among all project partners to be able to offer a homogeneous coaching framework.

[1] V. Singh, S, Sankhwar, D. Pandey, "A framework for requirement elicitation", Global Journal of Multidisciplinary Studies, Volume 2, Issue 2, January 2014 (ISSN: - 2348-0459)

2.1 PHE Requirements naming and categorization

This section presents the specific nomenclature adopted to classify the different types of requirements. This ensures adequate traceability of the different requirements identified throughout the project.

Basically, requirements are divided into functional and non-functional. In addition, each requirement can be categorised into different sub-types. As a result, each requirement identified has its unique name and number, a brief description, and some other details. The nomenclature adopted is explained below.

NOMENCLATURE:

1. KR: Key Result tackled
2. FUN / NFR: Type of Requirement
3. Requirement subtype (if applies)
4. Requirement number assigned

2.1.1 Functional Requirements

The functional requirements define what the system should do. Typically, will specify a behaviour of function.

FUN = functional requirement

For example: KR1-FUN01

2.1.2 Non-Functional Requirements

Non-functional requirements describe how the system should behave. Typically, are considered as constraints upon the system behaviour or quality attributes of the system.

NFR = non-functional requirement

Within NFR, different types of requirements were identified:

I = Interoperability requirements

Re = Reliability Requirement

T = Technical requirements

P = Performance requirements

Pr = Privacy requirements

S = Security requirements

U = Usability requirements

In further elicitation processes it is probable that additional types of requirements will be identified.

3 PHE Coaching Framework Key Results

This section contains the Key Results (as reflected in the proposal) to be obtained through research and development of Coaching Framework along the project lifetime.

Key Result (KR1)	Coaching Framework
Objective1	New methodologies to develop interactive, dynamic and personalised coaching programmes utilising available monitoring input
KPI1:	Interactivity measured by platform's response time (less than 20 ms); level of dynamism measured by the capacity to rapidly adapt to changes in the user's data, environment, or any other data input (in less than 1 minute).
KPI2:	Personalization to each user's needs measured as the number of population segments considered (at least 2 segments regarding age -a<55, >55-, 2 segments for gender, chronic obstructive respiratory disease, 3 different non-chronic diseases or health related problems).
KPI3:	number of data inputs used (at least 3 different inputs for each coaching programme)
Actors	*Population at risk or patient*: Early detection of potential bad habits that can lead to a determined disease and personalized recommendation on how to improve their health or leveraging disease's effects, having real time recommendations based on their health state, and improving it. *Healthcare professional or Coach*: Having real time knowledge of user's state what leads to increasing the capability to guide users with higher quality and guarantees. *Health Insurance or Public Health*: Cost reduction as patients will improve their health and, thus, require less health services and disease treatments.
Objective2	Modularisation and standardisation of a coaching framework that facilitates scaling and deployment of coaching applications (including data management and communication) and allows for cooperation between stakeholders
KPI4:	Modularisation and standardisation measured by the number of components extracted from the project that can be independently used in order to achieve some of the sub-objectives of the project (at least 3) or used within other systems or communicating with them (at least 3), ease of deployment measured as the perceived difficulty by wellness and health specialists to learn how to use coaching application, cooperation between stakeholders measured as the level of integration of all actors of the market value chain in the coaching application (all actors should be integrated).
KPI5:	Number of modules, platforms and interfaces that are going to be open software in order to facilitate its interaction with other standards and European systems. No more than 2.
Actors	*Health Insurance or Public Health*: Possibility of combining the platform with other health services what will lead to covering a higher amount of different health cases. *Health Service Provider*: Possibility of combining platform with other services and enlarging their capabilities offering a wider portfolio of health services, what will lead to an outcome increase. *Health Data Aggregator*: Capability to incorporate other external sources to the offered data making analysis more effective and results more exact. *Health Data Analysis Provider*: Capability to incorporate other external sources to the performed data analysis and thus to increase its quality. *Measurement or monitoring solution provider*: Capability of using standardised devices and to change it depending on service needs what leads to more flexibility and to reduced costs. *Coaching Tool Developer*: Ease to develop new compliant services according to standards. *Technical Service Operator*: Ease to adapt to user demands and scaling depending on service charge, which will lead to cost reduction, and offering a higher QoS.

Objective3:	Motivating approaches resulting in long-term adherence and behaviour change
KPI6:	Long-term adherence measured as the percentage of users that continue using the coaching framework after 2 months (at least 50%), behaviour change measured as user's data inputs' improvement in terms of wellness and health care for each specific case and disease (specific sub-KPIs for each segment and disease to be determined during the project)
KPI7:	Rate of accomplishment of objectives or % of recommendation made by PHE that are met. This is a measure of the adherence to recommendations made by PHE. The system should avoid recommendations that are not followed during their treatment due to a poor design. This should be more than 80%.
Actors	*Population at risk or patient*: Higher effectivity on disease treatment or preventive measures and, thus, improvement of their health. *Healthcare professional or Coach*: Ease to follow users over time and creation of more effective and trustworthy therapies or treatments. *Health Insurance or Public Health*: Cost reduction as users will need less medical treatment.

4 PHE System Requirements

This section compiles the identified requirements that describes how the coaching platform should behave in order to deliver the features and services PHE is aimed at delivering.

4.1 Functional Requirements

The functional requirements state how the PHE Coaching platform should work and listed below.

Req. ID	KR1-FUN-01
Req. Short Title	CRUD user
Req. Description	The system should allow to create, read, update and delete user profile
Application	User definition
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-02
Req. Short Title	User Clustering
Req. Description	Definition of different Groups of Users (Clusters) based on user-profile and User Interactions
Application	Personalization Coaching Mechanisms
Importance	Relevant
Priority	Medium

Req. ID	KR1-FUN-03
Req. Short Title	Knowledge database
Req. Description	The system must include a Knowledge database to feed the coaching module with the clinical standard recommendations
Application	Allowing clinical driven recommendations
Importance	Relevant
Priority	Medium

Req. ID	KR1-FUN-04
Req. Short Title	Knowledge database Management / Backend
Req. Description	The system must allow the management of the knowledge available in the Knowledge database either automatically using file inputs or data processing or manually through the use of an application where the coaching manager can manage the available knowledge.
Application	A flexible data model, especially to handle different type of data and allowing driven recommendations
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-05
Req. Short Title	Communication
Req. Description	The system should combine data from the monitoring component and the knowledge database.
Application	Guarantees adequate recommendations
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-06
Req. Short Title	Authentication to Google Fit
Req. Description	Service request to the Google URL to get the authorization code. This code is then used for the user to login.
Application	DCA, web application is designed to poll the Google URL at specific time intervals.
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-07
Req. Short Title	DCA's Activity Data Import and Calculation
Req. Description	All Activity Data Import are calculated by employing specific evaluation approaches.
Application	This must provide accurate and reliable evaluation results of fitness and health of the user
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-08
Req. Short Title	Ontology model for health care issues
Req. Description	Redesigning the ontology platform to handle different sources
Application	This ontology is considered as a declarative model that defines the concepts existing in the system, their attributes, and the relationships between them.
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-09
Req. Short Title	User definition
Req. Description	Enrol the application with using the user-related data. Data types will be default and changeable.
Application	Registration
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-10
Req. Short Title	Activity type definition
Req. Description	Definitions of possible activities will be changed according to daily healthcare issues, preferences, and user profile.
Application	Registration
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-11
Req. Short Title	Home Page Specification
Req. Description	The counting steps taken by the individual user and his/her calorie account will be seen in the home page. Apart from that, aim of daily movement and score of cardio will be updated according to this data. The individual's details of pulse and blood pressure will be kept in the application. The monthly and daily changes of the individual will be kept graphically in the homepage.
Application	Home Page Module
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-12
Req. Short Title	Calculation calorie and motion
Req. Description	Calculation – every X numbered step equals one minute of the activity movement and daily goal will be achieved in that manner. Calculation – individual take X step in a moment it equals 1 cardio point in the framework of application.
Application	Home Page Module
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-13
Req. Short Title	Daily Activities
Req. Description	In the scope of mobile application, there will be addible activity types, it gives opportunities to individual decisions.
Application	Daily Activities Module

Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-14
Req. Short Title	Change monitoring account
Req. Description	Able to track more than one monitoring account
Application	Profile Module
Importance	Relevant
Priority	Medium

Req. ID	KR1-FUN-15
Req. Short Title	Change the settings
Req. Description	Integration between activities and other values that can be convertible and will be controlled with settings section.
Application	Profile Module
Importance	Desirable
Priority	Low

Req. ID	KR1-FUN-16
Req. Short Title	Data Management by user
Req. Description	Data which are in the part of the application will be controllable by user.
Application	Profile Module
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-17
Req. Short Title	Data Management by Health Experts
Req. Description	Rules and patterns should be controllable by the health experts.
Application	Rules / Patterns / Recommendations / Goals
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-18
Req. Short Title	Sensor-based Data Management
Req. Description	There will be sensor definition pages. Due to the defined sensors, data flow will be established.
Application	Sensor Module
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-19
Req. Short Title	Manage Clinical Information
Req. Description	Healthcare professional should be able to create, edit, view and remove patient clinical information.

Application	Healthcare Professional Application
Importance	Mandatory
Priority	High

Req. ID	KR1-FUN-20
Req. Short Title	Feedback
Req. Description	Patient can provide positive or negative feedback after receiving a certain recommendation
Application	Provide feedback after a recommendation is received
Importance	Mandatory
Priority	High

4.2 Non-Functional Requirements

The non-functional requirements state how the PHE Coaching platform should behave, the qualities it should have and constrains under which it must operate. They are not part of the rationale of the system but are necessary to operate the same in the desired manner. Non-functional requirements have impact on the functionality of the system.

The identified non-functional requirements for the PHE Coaching Platform are listed below.

Req. ID	KR1-NFR-U-01
Req. Short Title	Usability
Req. Description	The user interfaces of the system and mobile application must be intuitive and easy to use by each user profile
Application	Incentive the use of the proposed solution
Importance	Relevant
Priority	Medium

Req. ID	KR1-NFR-S-01
Req. Short Title	Security
Req. Description	Authentication and authorization mechanisms to access to the coaching components should be developed to ensure the security and integrity of the data
Application	Correct and secure access to the data
Importance	Mandatory
Priority	High

Req. ID	KR1-NFR-P-01
Req. Short Title	Performance
Req. Description	The coaching components must be fluid and can process information and generate recommendations quickly.
Application	Efficient processing of data
Importance	Relevant
Priority	Medium

Req. ID	KR1-NFR-Ra-01
Req. Short Title	Communication
Req. Description	The coaching component should receive the confirmation of data reception in the user smartphone
Application	Guarantee that confirmation is sent to the coaching component
Importance	Relevant
Priority	Medium

Req. ID	KR1-NFR-I-01
Req. Short Title	General interoperability/ Reliability
Req. Description	The coaching components must organize and store the data in way to allow interoperability with all the components of the integrated system
Application	Correct flow of the data between components
Importance	Mandatory
Priority	High

Req. ID	KR1-NFR-U-02
Req. Short Title	DCA visualization
Req. Description	The database has to be visualised for end-users in a meaningful and user-friendly manner.
Application	Help to evaluate and analyse the data in a more appropriate manner
Importance	Relevant
Priority	Medium

5 Development Constrains

Synchronization	Online and Offline Interaction with the Application It is intended to develop a system that can operate correctly with and without internet connection. This will require an additional development effort to assure that there are mechanisms that can deal with asynchronous information that is generated.
Data Collection Risks	Third party data providers like Google fit may change their data sharing policy during the project. Hence, alternative and equivalent tools should be backed up.
Semantic Sensor Network	Mislead of the information collected from the semantic sensor network. It needs an extra pre-processing in order to detect or recognise complex behaviours (like emotional state of a personal) and the error can be high.

6 Conclusions

The requirements set in this document together with the requirements that were described in D2.1 will establish the basis for the development of the PHE solution.

Hereunder are listed all the requirements ordered by Priority in a first level and Importance on a second level. This list aims at serving as a roadmap on the development of the project. Although most of the requirements are necessary for both use cases, in this list it is specifically pinpointed to which use case is related.

ID				Requirement Title	Importance	Priority	Use Case Relation
KR2	FUN		01	Creating monitoring profile	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		02	Selecting monitoring profile	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		03	Data Collection	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		04	Questionnaires	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		05	Respiratory sounds collection	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		06	Data Modelling	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		07	Activity tracking	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		08	User - App Interaction	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	FUN		09	User Modelling	mandatory	high	Healthy Workplace / CORD Mgt.
KR2	NFR	I	01	General interoperability	mandatory	high	Healthy Workplace / CORD Mgt.
KR3	FUN		02	Basic Data Analysis	mandatory	high	Healthy Workplace / CORD Mgt.
KR3	FUN		03	Data Model	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		01	CRUD users	mandatory	high	Healthy Workplace / CORD Mgt.

KR1	FUN		05	Communication	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		06	Authentication to Google Fit	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		07	DCA's Activity Data Import and Calculation	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		08	Ontology model for health care issues	mandatory	high	Healthy Workplace
KR1	FUN		09	User definition	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		10	Activity type definition	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		11	Home Page Specification	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		12	Calculation calorie and motion	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		13	Daily Activities	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		16	Data Management by user	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		17	Data Management by Experts	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		18	Sensor based Data management	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	FUN		19	Manage Clinical Information	mandatory	high	CORD Mgt.
KR1	FUN		20	Feedback	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	NFR	S	01	Security	mandatory	high	Healthy Workplace / CORD Mgt.
KR1	NFR	I	01	General interoperability / Reliability	mandatory	high	Healthy Workplace / CORD Mgt.
KR3	FUN		01	Data Validation	relevant	high	Healthy Workplace / CORD Mgt.

KR2	NFR	Pr	01	Data Privacy	mandatory	medium	Healthy Workplace / CORD Mgt.
KR2	NFR	Re	01	Communication with analysis system	relevant	medium	Healthy Workplace / CORD Mgt.
KR3	FUN		04	CORD state from respiratory sounds	relevant	medium	CORD Mgt.
KR3	FUN		05	Exacerbation detection	relevant	medium	CORD Mgt.
KR3	NFR	Re	01	Data quality	relevant	medium	Healthy Workplace / CORD Mgt.
KR3	NFR	T	01	Intelligence Business Algorithms	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	FUN		02	User Clustering	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	FUN		03	Knowledge database	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	FUN		04	Knowledge & database Management / Backend	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	FUN		14	Change monitoring account	relevant	medium	Healthy Workplace
<KR1	NFR	U	01	Usability	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	NFR	P	01	Performance	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	NFR	Re	01	Communication	relevant	medium	Healthy Workplace / CORD Mgt.
KR1	NFR	U	02	DCA visualization	relevant	medium	Healthy Workplace / CORD Mgt.
KR2	FUN		10	Access to medical records	desirable	medium	Healthy Workplace
KR1	FUN		15	Change the settings	desirable	low	Healthy Workplace / CORD Mgt.