Deliverable 5.4

Definition of shared exploitation model

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1. Intent of document

The intent of this document is to define the Helicopter service in its current form, its current value proposition, and its current market exploitation roadmap strategy. It builds on the AAL Mid-Term report *AAL HELICOPTER outline of business and exploitation strategy activities* as well as the knowledge ascertained in conjunction with the pilot participants and disseminated in deliverable 5.3.

2. Introduction

The Helicopter service is an unobtrusive sensor based activity monitoring system that is able to track multiple users in a home environment. The service monitors for instance physical activity, sleep cycles, and toilet visits and if the user wishes clinical data such as heart rate and glycose levels through clinical sensors which can be added to the service. Its main purpose is to keep users active and motivated to move by giving feedback to each user through an app.

The uniqueness of the Helicopter service lies in its diagnostic suspicion approach. Most activity monitoring services try to identify the activity of a person within an environment and based on that activity make a diagnosis. Instead, the Helicopter service searches for suspicious identifiers of a number of diseases (e.g. diabetes) and based on that tries to identify the activity (e.g. toilet visit or sleeping).

The Helicopter service can however also be used simply as an activity monitoring system in the home, in this option the clinical sensors are not used. The sensors installed in the home together with the portable identifier are then used to keep track of for instance sleep cycles, steps taken etc. data which can be accessed by the user through the tablet application.

2.1. Current potential market competitors

Currently the market for wearable activity monitoring systems (often in the form of wristbands) is filled with different actors. Every one of them offer potential end-users the ability to keep track of their daily activity with different measurements. However, all of these give little insight into the health status of a person, nor is their intent.

There are also other smart home systems in which the user can control different aspects of the home such as lighting, temperature and whether the front door should be locked or not. Within these sensor ecosystems a plug-n-play easy to install activity monitoring component was released, similar to the sensors used in the Helicopter system, however with a different purpose and lacking the individual identification that the sensors used in the Helicopter system have.

There is an activity monitoring service similar to the Helicopter service available mainly on the Dutch market where sensors are placed in the home in order to track the activity of a person living there. Keyrings are then given to people often visiting the home of the person owning the system in order to keep track of their movement and how often they visit. The data collected by the sensors are then accessed through an online dashboard. Similar to the Helicopter system the system is static in the sense that the sensors are connected to the home environment and not outside, for instance when going shopping. The data collected by the system can be used for health related matters. This service is available on the market and is currently the main competitor to the Helicopter service, however, what differentiates the Helicopter approach is the diagnostic suspicion and the clear connection to healthcare.

3. Service Concept

The Helicopter service was piloted in two different versions due to national regulations of the piloting countries. In Skövde, Sweden no clinical sensors were used what so ever and in Eindhoven, Netherlands not all but some of the clinical sensors were used during the end of the pilot. In addition, the pilot was split in several different stages where more and more functionality was introduced into the pilot. From a user perspective, this meant either that more functionality was introduced into the app, e.g. the ability to see data from the sensors in different charts, or using the clinical sensors in the system. The intent of the project was to have at least two months of the finalised service for testing in the homes of the elderly, this intended the full implementation of the diagnostic suspicion algorithm; acquisition, evaluation and feedback to the user. This goal was reached for 2/3 where the acquisition of data and evaluation thereof was implemented and running, however, the feedback to the user during these final 2 months was missing. Table 1 below illustrates the different phases of functionality introduced.

	Phase 1	Phase 2	Phase 3
Functionality	Sensors working and application able to set up and "order" sensors	Behavioural data collected through sensors but pilot users not able to see any charts in application	Diagnostic suspicion algorithm activated (acquire, evaluate, feedback). The acquisition and evaluation was implemented successfully in the system

Table 1: General overview of functionality introduction for the Helicopter service throughout the project.

In addition to the introduction of service functionality Figure 1 below presents the general service journey as the service is intended to be experienced. Note however that the connection to the GP was not experienced by the end-users within this project due to aformentioned reasons.

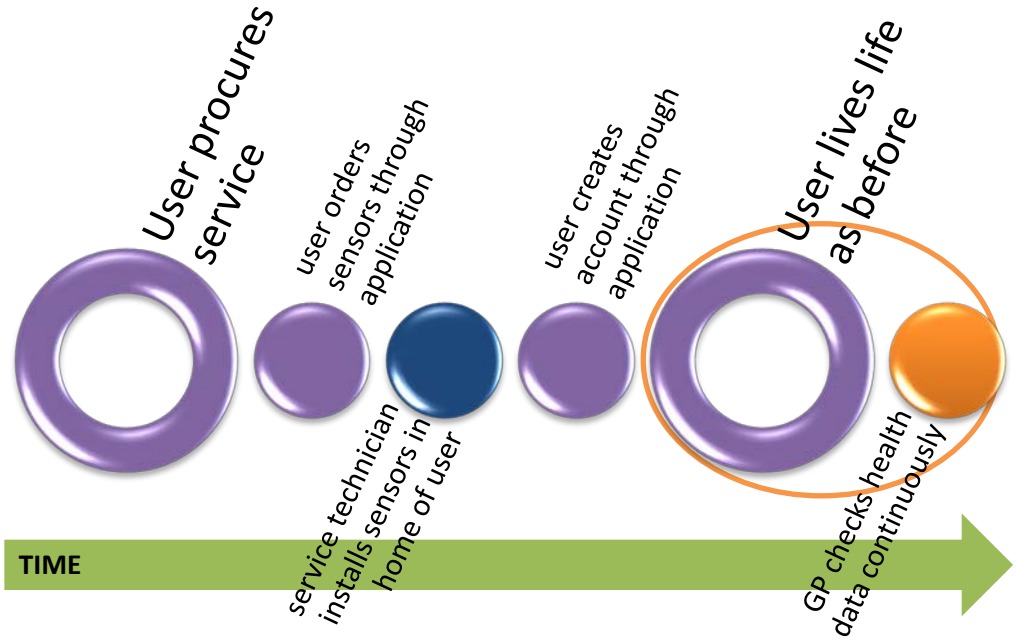

Figure 1: General overview of service journey. Purple = User actions, Navy Blue = back-end service provider, Orange = healthcare professional

3.1. Technical requirements of the current service concept

In this section the technical requirements which upon the Helicopter service is supposed to run are presented. This includes the algorithms of the diagnostic suspicion, the platform, the database, the connected learning model, everything physical in the service such as the sensors, and the tablet application. However, this section does not give a detailed overview of these components, that can be found in other deliverables.

All of the back-end structures in the systems are based on open source solutions in order to support future interoperability possibilities. The tablet runs android and hence the application is android based.

All of the sensors in the project were customised by UNIPR, to introduce and test the identification feature (i.e., the ability of an environmental sensor to identify the interacting user, among many wearing wearable devices in the same home environment). Besides such peculiar feature, however, the communication infrastructure is compliant with wireless communication standards, so that any OTS device can be straightforwardly incorporated into the network. Data coming from sensors are suitably abstracted, so that neither the supervision software nor the data analytics section depends on the actual sensor physical details and are open to addition of third-party devices.

The algorithm upon which the diagnostic suspicion model relies on is already released as open source and available for anyone interested.

3.2. User expectations on the current service concept

This section highlights feedback received on the piloted service from pilot participants. The feedback will be presented under the headings of what the service should try to achieve, what the service should avoid and some general remarks about the service.

The data presented in this section is based on answers given by the pilot participants in connection to three different activities; a workshop in each of the pilot countries (SWE & NL), an interview and a questionnaire. All of which focused on the users experience of using the service and what value they could draw from it. The total number of respondents for each activity can be found in Table 2.

Activity/number of respondents per country	Workshop	Interview	Questionnaire	Maximum number of respondents
Netherlands	7	3	13	28
Sweden	9	9	9	10
Total	16	12	22	38

Table 2: Amount of respondents for each of the evaluation activities.

It should also be noted that all the respondents participating in the pilot activities could be considered *early adopters* in addition to, having personal incentives such as being part of lobbyist groups etc.

Achieve:
In the achieve category service improvements on the current service concepts, which are necessary according to the pilot users, are presented. Without these improvements, the proposed value of the service will be hard to reach.

The most desirable and important achievements of a finalised service according to the pilot respondents are an easy to install sensors, almost plug-and-play, that do not need weekly changes of batteries. If possible, batteries should not need changing with an interval stretching up to every 6 months. However, it should also be stated that the sensors used during the pilot were prototypes as well, which meant that battery drawing functionalities for internal monitoring purposes were turned on. Functionalities that will be turned off once design is finalised. In addition, many of the respondents that were familiar with computers and tablets clearly stated that they wanted to choose for themselves where to access their account, i.e. on iOS tablets and online via computers.

Apart from a platform independent service users when probed also wanted a more mobile system that tracked them not only in the home but also accounted for their movement outside of their home, something which the current service is not designed to be.

The pilot respondents state that they would like to trust the service and that one way to ensure trust is to create a personal recognition with the professional caregiver that is entrusted to check on their data. However, they would still like to feel that they are in control of their data and that help is only given when (and if) needed. Should help not be needed check-ups of some kind should be offered to simply say that everything is okay.

Avoid:
In the avoid category things that the service concept need to avoid, according to the pilot participants, are presented. If these points are not avoided the proposed value of the service will be hard to reach.

One of the major issues experienced throughout the pilot were the technical problems which lead to for instance the huge drop of motivation among pilot participants in the Netherlands and hence also the unwillingness to actively participate in the evaluation activities.

During the pilot the respondents experienced several occasions where they did not know whether the sensors were working or not which made them feel unsafe and unsecure, something that they remarked on cannot happened in a fully operational setting.

The final remark which the respondents feel needs to be avoided at all costs is an effect of the two mentioned above, namely clear instructions of who to contact within the service ecosystem when technical issues do occur. The respondents understand that technical issues are unavoidable however they should be resolved fast and without hassle.

General remarks from interviews and questionnaires
General remarks are remarks that were mentioned by the pilot participants regarding the service, this could be anything from how it should be sold and to whom to what type of data they would like to see in the application.

General reflections of the service from the pilot respondents are that the marketing efforts should be focused on me the everyday person and not on people who already have some sort of chronic disease. In the pilot respondent's opinion, they will get attention from the healthcare system anyway. If people not directly in need of care can obtain and use the service they are also able to develop a dependable baseline for what is considered a normal activity pattern for them as individuals, something which would make them as users more confident in the feedback they receive according to the respondents. However, the acquisition of the service should under no circumstances be mandated by age according to the respondents.

In terms of data visualization, the respondents were mostly interested in the longitudinal data to see if their behavior 1) changed or 2) at least did not get worse. When it comes to the collection of the data it is important that they do not have to be active users in the sense that they need to provide the service with anything, they should be able to live their lives unchanged. Hence, it is important that the service components are both easy to install and maintain, e.g. battery changes which have been experienced as both problematic and time-consuming during the pilot.

In terms of acquiring and hence also paying for the service the respondents were hesitant to give an answer before knowing more about the final product. Based on what they have tested during the pilot they would not acquire the service but many feel that should the service be fully operational they would reconsider. The preferred means of paying would either be a one-time cost, free to sign up but additional costs depending on service functionality used or through a plan where they are charged by usage parameters. Very few mentioned what amount they would be willing to pay for each of the alternatives but for a one-time cost amounts up to €300 were mentioned and for monthly payments a somewhere between €20-30.

3.3. Lead Industry Partners view and demand on current service concept

This section stipulates a handful of requirements, set by the intended exploitation partner in the project METEDA, that need to be fulfilled before service launch.

The service needs to be fully operational and been clinically tested with positive intervention results before any market penetration will be considered. METEDAs intention is to start small in one or two regions in Italy to manage any initial set-up complications that might arise after launch. Thereafter scaling up of the service will be considered.

Within the service ecosystem focus will lie on partnering up with local GPs and home care services rather than with for instance larger companies such as telecom companies that would perhaps also be interested in the solution. This follows the reasoning of starting small and scaling up as adoption amongst users and health care providers are increasing.

4. Innovation levels

From a pure technological perspective, the most relevant innovative HELICOPTER outcomes include the upper system levels of supervision, communication, data analysis, identification of user which in themselves are not dependent on the actual choice of sensors. However, for the purposes of the project, the incorporation of the interpretation model (diagnostic suspicion) is dependent on the specific sensors. In addition, the entire diagnostic suspicion approach is innovative in itself since it shifts focus from trying to identify an activity and then diagnose a disease to looking for indicators of a disease and secondly identify an activity.

From a service and user perspective the most relevant innovative Helicopter outcomes include the ability to check data concerning oneself regarding activity levels and trends in activity, something the users emphasized as very interesting. In their opinion, once the connection to GPs are made it would be a very interesting feature.

5. Exploitation Roadmap

The project consortium including the main exploitation partner METEDA foresee two major paths forward for the exploitation of the project based on the feedback from the pilot respondents. In this section these roadmaps are outlined each on its own. However, there are several considerations which will be the same no matter which roadmap is selected, these are presented first.

Focus will be in the Italian regions of Emilia-Romagna and Marche where there are good infrastructural possibilities for services of this kind, in addition, the main exploitation partner METEDA headquarters lie in San Benedetto in the Marche region of Italy allowing them to exert their knowledge of the market upon launch. By focusing on Italy, the main competitor on the market can be avoided since it operates mainly on the Dutch market.

The potential market niche will remain the same as projected in the project charter, namely people over 65. It is also the intention to create a direct relationship with consumers in terms of sales and incorporate potential service stakeholders in the delivery process instead of the sales process, i.e. instead of having for example home care organisations buying and delivering the service to their customer's focus would lie directly on the customer and have the home care organisations deliver the care within the service ecosystem.

In addition to, and due to the above, the consortium brainstormed two possible, but not mutually exclusive, options for realising the Helicopter or at least part of the service in the future.

Option 1:

The first, and preferred by the project consortium, exploitation option for the Helicopter service, is to go ahead and clinically test the system regarding the diagnostic suspicion algorithm. It would be a rational choice to conduct the clinical test in the regions in which market launch is first planned. This would require the consortium or parts of it to go ahead and apply for further project funding from another European or local Italian call. Should the clinical testing of the Helicopter be approved and proven successful the service can be offered on the market to be bought. This in turn implies that iterative redesigns based on user feedback have been conducted during the testing period.

Option 2:

The other option identified by the project consortium is to let consortium partners find other potential outlets. The sensors can for instance be sold separately after certification and included into any behavioural tracking sensor ecosystem. The application can be released onto the play store immediately for anyone to download. Finally, the diagnostic suspicion algorithm is already available as open source to download for anyone, free of charge.

6. Conclusions

Albeit that the project was not able to carry out an extensive validation of the diagnostic suspicion algorithm through project pilots, early projections are positive. In addition, the functionalities that are in use, mainly the behavioural pattern mapping through the sensors, are experienced as very interesting by pilot users. However, improvements need to be made for the service and the technical installations and maintenance are one important factor highlighted by pilot participants. Due to the feedback received by the pilot users the project consortium identified two potential options moving forward. The preferred option of the two is to continue with testing the algorithm before moving forward with service development, preferably with a clinical trial.