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***Deliverable D3*: PSS concepts - summary of the development of and initial value proposition and product-service-system concept developed based on the involvement of stakeholders (associated with task T 1.3).**

Abstract: This deliverable report presents the outcomes of the four co-creation workshops and the final consolidation workshop. These workshops were organised at SK, Lyngby, ZZ and HUG between June 2016 to Oct 2016 to create initial product-service-systems (PSS) based on the challenges and opportunities identified from the earlier defined personas and experience mapping at each local testbed. To accomplish this task, a co-creation method was developed based on the Value Design Method to support multi-stakeholder ideation when creating PSS. In total, 72 ideas were created and 13 concepts were chosen for further development. Both REACH Engine concepts as well as REACH touchpoint concepts were created. At the consolidation workshop, each testbed was able to make concrete decisions on what the next step was and which concept to start with. These results will provide along with the analyses conducted in T1.3 useful input for WP1.4, and the upcoming development oriented WPs (WPs 2-5). More specifically, the resulting concepts will be used to define functional requirements and specifications in WP1.4, and to subsequently specify the related technical systems and data gathering, engineering and analysis structure.

Lead Partner:	TU/e
Participants:	DTU (1,5 PMs); TU/e (2,5 PMs); Kop (1PM); Alreh (1PM); Philips (4PM); Sturrm (0,5PM), ZZ (1PM) Lyngby (1PM); SK (1PM); HUG (5PM)
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Authors:	TU/e (Y. Lu, J. Steenbakkers, C.A.L., Valk, M.M. Bekker), HUG (D. Dietrich, C. Perrin), ZuidZorg (G. van Bakel, H. Cornelis), Lyngby (J. S. Nielsen, W. Berndtson), Philips (T. Visser, O. Toshniwal, G. Proctor, I. Owusu), DTU (H.B. Andersen, M. Yasuoka), Sturrm (C. Boom), CU (H. Langberg)

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01.06.2016	WP strategy and activities plan ready	completed
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Tasks of the involved partners with respect to the deliverable (and respective tasks) presented in this report:

Partner	Short task description
DTU	Participate in the workshops and review report
TU/e	Define, prepare and execute workshops and lead report writing
CU	Participate in the workshops and review report
Alreh	Participate in the workshops and review report, prepare strategy for WP1.4
Philips	Define, prepare and execute the workshops and lead results consolidation
Sturrm	Offer expert comment and participate in the workshops and review report
ZZ	Prepare, support the execution of and participate in the workshops and review report
Lyngby	Prepare, support the execution of and participate in the workshops and review report
SK	Prepare, support the execution of and participate in the workshops and review report
HUG	Prepare, support the execution of and participate in the workshops and review report, reflect the results together with early testing
ArjoHuntleigh	Prepare, support the execution of and participate in the workshops
Biozoon	Participate in the workshops
Smart Cardia	Participate in the workshops
TUM	Participate in the workshops, facilitation of participation and engagement of partners, support with touchpoint/engine concept consolidation and composition
EPFEL	Participate in the workshops
Frauhofer	Participate in the workshops
DIN	Participate in the workshops

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Key expressions

Abbreviations for partners:

AH: ArjoHuntleigh
AM: Alreh Medical
CU: University of Kopenhagen
DTU: Technical University of Denmark
EPFL: The École Polytechnique Fédérale of Lausanne, Switzerland
HUG: Hôpitaux Universitaires Genève
SC: SmartCardia
SK: Schön Klinik
TU/e: Eindhoven University of Technology
TUM: The Technical University of Munich
ZZ: ZuidZorg

Business Model: *"A business model describes how an organization creates, delivers, and captures value"* (Osterwalder and Pigneur, 2010)

Co-creation*: "The joint creation of value by the company and the customer; allowing the customer to co-construct the service experience to suit their context" (Prahalad and Ramaswamy, 2004)*

Consolidation workshop: A consolidation workshop in this report refers to a workshop in which stakeholders combine different results of early stakeholder workshops and create the integrated solutions more effectively**.**

Engine concept: A REACH Engine concept refers to a cloud-based digital platform/back end that supports health and behavioural data analysis, creates different user profiles and provides personalised motivation and real time feedback to both the user and their caregivers.

Experience flow template: The experience flow template, created for the REACH project, helps write down any thoughts, feelings and actions customers might experience or do by using the designed product or service.

Experience mapping: Experience mapping is a method to create the experience maps, one of the Philips' most useful tools, to understand people and their experiences to deliver meaningful innovations (Philips, 2014).

Framing opportunities template: The framing opportunities template, created for the REACH project, aims to identify the design opportunities and formulate the design challenges based on earlier identified user insights.

Idea template: The idea template, created for the REACH project, aims to capture the created ideas by specifying what the idea is, why this idea, how it works and what capabilities are needed to make it happen.

Insight cards: A set of visual cards, developed for the REACH project, describes the user insights of great interests to the local use cases and REACH project objectives.

Personas: Personas is a reliable and realistic representations of your target users of the intended products and services (Pruitt, J. and Grudin, J., 2003).

Product-service-systems: Product-service-systems can be defined as "*a marketable set of products and services capable of jointly fulfilling a user's need*" (Goedkoop, et al. 1999).

Service blueprint template: The service blueprint template, created for the REACH project, aims to describe the different actions that the stakeholders need to take in order to realise the intended services and experiences for the target customers.

Service Blueprint: The service blueprint is a technique to support creating and managing service innovations. By defining customer actions and the resulted physical evidences, separating visible from invisible customer contact with employee, and identifying the support processes in the background, this technique can demonstrates different processes with the organization in order to create and deliver the intended services (Shostack, 1984).

Stakeholder workshop: A stakeholder **workshop** is a type of interactive meeting where participants with different backgrounds and expertise actively carry out a number of activities rather than passively listen to a presentation.

Stakeholder: A stakeholder in this report refers to the individual organisation (profit or non-profit) that has interest and concern in the REACH project.

T: Task defined in the project proposal.

Touchpoint/Touchpoint cluster: Touchpoint refers to each form interaction that your customers have with your products and services. It includes any physical, communication, human and sensory interactions with and within your organizations (Brigman, 2013). Touchpoint cluster in this report refers to those touchpoint concepts that share common purposes such as touchpoint concepts for mobility services or similar technology platform such as touchpoint concepts based on wearable technologies.

Use case setting: Use case setting refers to the four solution operators and this report called them the use case setting since they reflect concrete application scenarios.

Value chain: According to Porter (1985), a value chain is a set of activities that a firm performs in order to deliver a valuable product or service for the market.

Value Design Method: Value Design Method aims to support the value co-creation and networked innovation with the consideration of stakeholder expectations and relations. It is recommended to apply this method when there is already an initial design concept and a need to integrate knowledge from experts and related stakeholders (Gultekin et al., 2016).

Value network: "*A value network is defined as a value creating system in which all involved stakeholders co-produce value"* (Normann and Ramirez, 1993).

Value proposition: "*Value proposition describes the benefits that your customers can expect from your products and services*" (Osterwalder, et al. 2014)

What-if cards: A set of visual cards, developed for the REACH project, provides possible questions to stimulate the brainwriting session. These what-if questions were formulated based on the interests of REACH and the needs of the use cases.

WP: work package defined in the project proposal.

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1 Background and summary of tasks and activities related to T1.3/D3

Work description in DoA: In this task workshops will be designed and organised to create the initial value proposition and product-service-system concept within multi-stakeholder use cases. Relation to other tasks: T1.1, T1.2. Methods and tools used: Value design method and value creation canvas will be used to organise workshops together with the multi-stakeholder network.
Description Deliverable D1.1: PSS concepts - summary of the development of and initial value proposition and product-service-system concept developed based on the involvement of stakeholders (associated with task T1.3).

In the REACH project, a sensing-monitoring intervention system will be developed that can be placed in an unobtrusive manner in various care settings and living environments of elderly citizens. The system will be able to: (1) use a set of sensors to detect selected vital signs, behavioural/care patterns, and health states; (2) predict – as early as possible –future health states, risks or events (loss of function, frailty, stroke, etc.); and (3) provide and coordinate proactively a set of customised services and products that have the overall aim at stimulating and supporting physical activities. Early intervention by REACH should allow for the time spent in a desirable health state (baseline health), and Healthy Life Years (HLYs) to be increased, and that the time spent in Long-Term Care (LTC) facilities is reduced. In that context, it will be shown that REACH can improve and speed up, on the one hand, the physical and cognitive rehabilitation of elderly citizens in deteriorated health states or suffering from a sudden incident, for example, by speeding up their transfer from acute care to rehabilitation to home care, as well as their health state improvement within one of these institutions. On the other hand, it will be demonstrated that REACH can be utilised in home/home care contexts for as long as possible to keep people in a desired base-line health state, mitigate the risk of deterioration, and finally slow down or prevent deterioration.

As described in detail in the in parallel executed task/deliverable T1.2/D2 (Section 1.1 Background and task definition) the ambitious and relatively wide-ranging objectives of REACH have a common denominator, described as well in the proposal and Description of Action (DoA). The overall purpose of REACH is to reduce the risk of functional loss of elderly citizens (65+) by sensing and promoting physical activity. This is summed up in Figure 1, in which we illustrate how activity is both monitored and promoted. We monitor in order to predict and intervene against frailty and we intervene by supporting and promoting physical (and social, playful and otherwise engaging) activities – for the purpose of preventing loss of function that is interlinked with a wide variety of afflictions characteristic of aging.

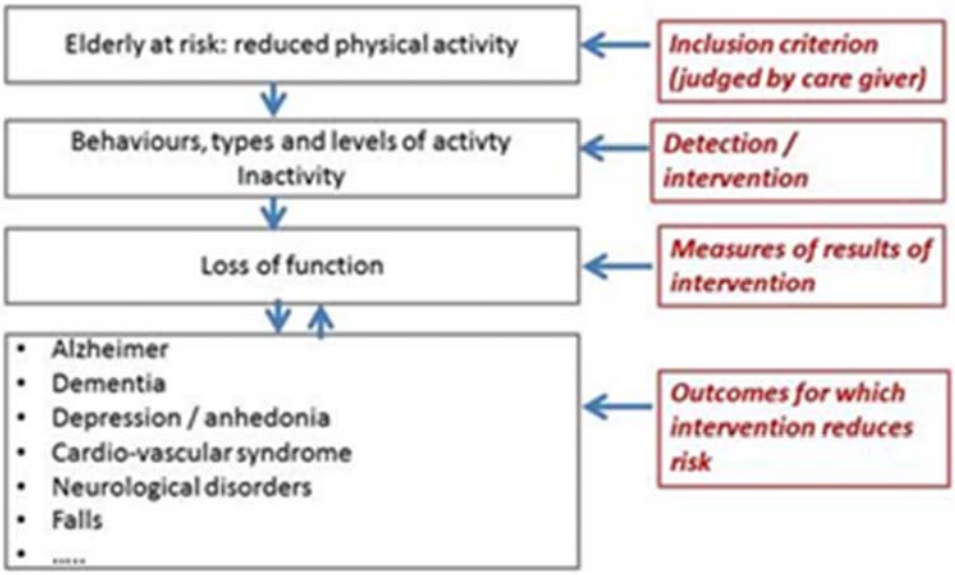

Figure 1. REACH target audience admission criteria (see REACH proposal Figure 1-1 page 5)

In order to develop the above-mentioned features in a target-oriented manner, REACH integrates various stakeholders such as knowledge providers (research, universities), technology providers (sensors, prediction, intervention mechanisms), multiplicators (insurance providers, standardisation organisations, etc.), and solution operators (clinics, rehabilitation centres, home and home care providers) into a joint development team. REACH will carry out the development of the mentioned features within four years, through nine work packages and in three iterative development cycles (phase 1: mock-ups and lab testing of single technologies; phase 2: mock-ups and short-term tests with subsystems in real-world environments; phase 3: system prototype long-term testing in a real-world environment). The four solution operators (called in REACH “use cases” or “use case settings”, since they reflect concrete application cases for the REACH system) – University Hospitals of Geneva (HUG), Schön Klinik (SK), ZuidZorg (ZZ) and Lyngby-Taarbæk municipality (Lyngby), which are part of the REACH consortium – in that context reflect two dimensions:

1. Health state dimension: the four use case partners represent the most relevant ways or transfer possibilities for the elderly through various health states and institutions (e.g. from hospital to rehabilitation to home in the case of a health state improvement; alternatively, from home to hospital/rehabilitation in the case of a health state deterioration). The REACH system should be able to move with the elderly through the various health states/institutions.
2. System development dimension: the four use case partners represent the development strategy. Development will, in the early phases of the project, target the more “structured environments” (clinic/HUG; rehabilitation/SK), since here requirements are more obvious and system features are easier and faster to be verified and validated. These technically complex solutions can then in later project phases be step-by-step (in an adapted and simplified form) transferred into the home care (ZZ) and smart home (Lyngby), using case contexts and opening new markets in these fields for REACH industry partners.

WP1 will in the first 14 project months (Milestone 2) detail the REACH concept and system design before in WP2-WP5, the individual subsystems are developed and subsequent

system integration and testing/demonstration are conducted (WP6). WPs 7, 8 and 9 are concerned with cross-sectional topics such as usability, ethics, safety, security, business models and project management.

WP1 consists of four work tasks and will follow a systematic system development approach. The following table and figure indicate the different tasks in WP1 and their relations.

Table 1. Overview of different work tasks in WP1

WP subtasks	Description
WP1.1	Use case setting analysis and definition
WP1.2	Tools and approaches: motivational strategies, stakeholder networks, sensors/algorithm approaches, early testing of first strategies
WP1.3	Product-service-system concept co-creation
WP1.4	System architecture definition

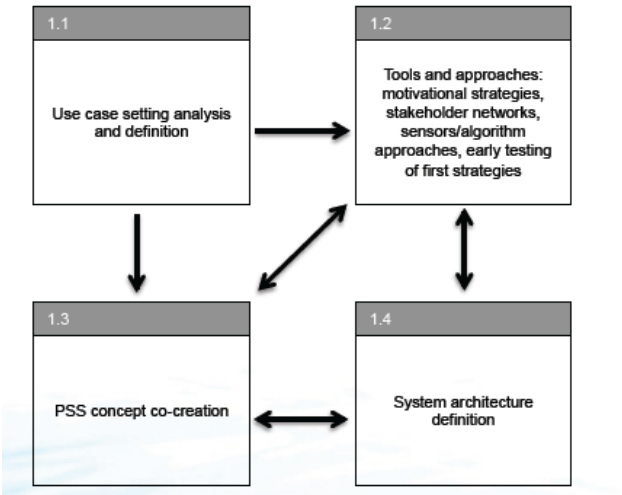

Figure 2. Visualisation of WP1 work-task relations

This report is specifically reporting the development initial product-service-system concepts together with the stakeholders in the four different use cases through co-creation for T1.3.

The ambition of T1.3 was to create a set of initial value propositions related to the intended product-service-systems (PSS) together with multi-stakeholders in the different care settings and home environments in the four use cases, and to develop the first REACH system proposal. These PSSs were developed based on the user insights identified in WP 1.1, in which user insights in four different use cases were identified. T1.3 was carried out next to T1.2 so that the stakeholders' competencies and requirements as well as relevant tools and approaches (with regard to motivational strategies, sensors, early user feedback, etc.) can be taken into account seriously and continuously in this creative journey together with the use cases to encourage their participation in creating the future REACH system, as well as to ensure the strong end-user focus. The results of WP1.3 will serve along with the inputs from T1.2 as input to further define the overall system architecture architecture in WP1.4, as well as set up the initial frame of reference to develop the targeted REACH system for the entire project in the development oriented WPs (WPs 2, 3, 4, and 5).

In WP1.3, the aim is to create the initial PSS for each individual use case through creative co-creation workshops at different care settings and home environment. Four co-creation

workshops were defined, prepared and carried out with the four different use cases identified in WP1.1, in which REACH subsystem PSS proposals were made. In between the workshops, reflection was made on the achieved results and the focus was very much on the differences between user cases, opportunities to improve the follow-up workshop and preparation for consolidation. After these four workshops, a consolidation workshop was carried out with the entire project consortium to reflect together on the intended REACH system.

A WP1.3 core team was formulated in which TU/e and Philips teamed up and met a weekly basis to centrally define, prepare, steer and carry out the workshops based on the Value Design Method and Business Model Canvas. Sturrm provided valuable input and business insights to the workshop activities. Together with SK, Lyngby, ZZ and HUG, detailed workshop plan was defined for each location, respectively. SK, Lyngby, ZZ and HUG recruited workshop participants from their targeted elderly user groups, former and informal caregivers, policymakers, and municipality and insurance companies. WP1.3 partnered those who actively participated in the workshops and reviewed the report. REACH technical partners also participated actively in the workshop activities and gathered insights for WP1.2 and WP1.4. One extra workshop was organised at the end to consolidate the workshop results at different locations and define REACH system level concepts as well as REACH subsystem concepts. The workshop plan of WP1.3 is summarised below.

Table 2. WP1.3 Workshop planning

June 21-22, 2016	Co-creation workshop in SK
Sept 5-7, 2016	Co-creation workshop in Lyngby
Sept 17-18, 2016	Co-creation workshop in ZZ
Oct 17-18, 2016	Co-creation workshop in HUG
Nov 10-11, 2016	Consolidation workshop in Eindhoven

As results, WP1.3 created the following deliverables

- Co-creation workshop method, including process and tangible tools/templates based on Value Design Method and Business Model Canvas (see Section 2)
- Visual report of individual workshop and consolidation workshop report (see Appendix C, Appendix E, Appendix G, Appendix I, and Appendix K)
- Final WP report
- A list of product-service-system concepts including
    - 5 REACH touchpoint concept clusters such as personal mobility, active environment, nutritional monitoring and intervention, gaming and training system, and wearable's (see Chapter 7 Section 7.3 Table 8).
    - 5 REACH Engine concept clusters such as safety feedback/control, pattern detection, interface and recommendation, care and life planning, platform and data gathering and storage system (see Chapter 7 Section 7.3 Table 9).

Whereas this deliverable (T1.3/D3) focused on the (bottom up) detailing of the overall concept and value proposition with the stakeholders, the in parallel executed task/deliverable T1.2/D2 focused on the analysis and testing of tools and approaches (motivational strategies, stakeholder networks, sensor/algorithm approaches, early testing of first strategies) that will be used to implement the overall concept. In T1.4/D4 of both overall concept and implementation tools towards the overall REACH system architecture

will be outlined. The task leaders of this three task (T1.2: DTU; T1.3: TU/e; T1.4: TUM) cooperated closely discussed task execution and integration in several meetings.

2 Workshop method: co-creation

All the new research fields related to ageing society, such as Active and Healthy Ageing, Ambient Assisted Living, and Gerontechnology, are considered complex innovations as they need to bring together multiple players and competencies with very different backgrounds, knowledge and goals. They employ different ways of thought, language and approach, and create different solutions for ageing challenges. In the context of the ageing problem in REACH, if we only take the medical care perspective, then REACH deals with biomedical problems and supports ageing people mainly by developing new medicines, medical equipment and procedures and restore physical functionality of elderly people so as to free up hospital beds; if we only take the home care perspective, then REACH is just about providing efficient care so as to manage the increasing care costs and limited care budgets. All these imply that REACH is dealing with a wicked problem (Rittel and Webber, 1973) and needs to pay more attention to relationships between different stakeholders and connections between their solutions than just work on the solutions from one single stakeholder only. Furthermore, Howard (et al., 2012) identified four main drivers, the Nexus of Forces: namely, advances in social, mobile, information processing (big data analysis), and the opportunities of cloud, which have strong influence on the way that products/services are being developed today. In this context, traditional way of developing products or services by passing them from one organizational unit to the next along the product development processes, value chain (Porter, 1985), is no longer capable of creating the competitive advantages that Porter (1985) has envisioned. In stead, a value network approach (Normann and Ramirez, 1993) is more desired according to Peppard and Rylander (2006) when addressing the evolution from value chains to networks, specifically in the context of mobile network operators. Since REACH operates between the traditional hardware/product development industries and digital technology/service development industries, it was therefore decided that REACH would take the value network approach (Norman and Ramirez, 1993) and involve all stakeholders to co-create value. How can we integrate different expertise and resources to create system-level concepts that provide us with better insights of, and relevant innovations to, ageing challenges is the question to be addressed in REACH.

Co-creation is a creative and collaborative activity. It is also an interdisciplinary process for people with shared goals, but different skills and knowledge, to collaborate together. This is a must-have approach when dealing with wicked problems such as the societal challenge of ageing. Co-creation is often seen applied to networked innovations where the value is created for the users through direct and indirect relationships with many partners at the network level. The development of the propositions and the related plan for realisation can be defined in relation to the input of the stakeholders based on their knowledge, resources and expectations (Basole and Rouse, 2008; den Ouden and Valkenburg, 2011; Tomico et al., 2010). Recently, Gultekin (et al., 2016) proposed the Value Design Method to support making design proposals with the consideration of stakeholder expectations and relations. This method was developed based on methods from design research and business and stakeholder management fields to support the value co-creation and networked innovation practices. The researchers recommended applying this method when there is already an initial design concept and a need to integrate knowledge from experts and related stakeholders. We therefore would like to explore the use of the Value Design Method to bring together the different stakeholders in the REACH consortium partners, support them to communicate with and understand each other, and bring forward a common language to define REACH PSS initial concepts.

Within the consortium partner participants in WP1,3 TU/e and Philips have many experiences in researching, organising and facilitating co-creation workshops. The Value Design Method (Gultekin et al., 2016) is, for example, a research method developed at TU/e.

When starting WP1.3, there were not initial design concepts yet and it was therefore not possible to apply the Value Design Method directly in the REACH workshops. It was decided to adapt this method and embed brainstorming kinds of activities into the Value Design Method. Since REACH workshops quite often involve as yet unacquainted multi-stakeholder with different interests and expertise from different national cultures in Europe, the brainwriting technique (VanGundy, 1984) was chosen to organise the group ideation session. During the brainwriting session, each individual participant would write his/her ideas on a sheet of paper. After ten minutes, the sheets are rotated to different people and build off what the others have written on their paper, continuing until everyone has written on everyone else's sheet. The entire session can last 20-30 minutes. In the end all group members will rank the generated ideas individually and select the most favourite idea to work on further.

The Value Design Method can then be applied to support a multi-stakeholder team to iteratively develop a proposition. It is executed by conducting pairwise comparisons between 1) design considerations (who are the users and what are their characteristics and context of use?); 2) stakeholder considerations (what are the drivers behind their actions, and what they can contribute to the propositions?); and 3) business considerations (what is needed to implement the propositions?). The method uses scenario as a dynamic thinking tool to evolve the propositions during the process and evaluate them from different perspectives.

For the WP1.3 workshops, the design considerations in the Value Design Method were extracted the earlier report WP1.1 in terms of user insights and to be used as input for the brainwriting session. The stakeholder considerations were extracted partly from the project proposal, the earlier report WP1.1 and the ongoing work in WP1.2 on stakeholder analysis. During the workshops, the participants could also enrich the stakeholder insights related to them. Business considerations were created using the philosophy behind the service blueprint approach to define the responsibility of different stakeholders involved.

Different co-creation templates were created to support the documentation of the workshop results. They could be categorised into three clusters: input, trigger and ouput. Input card consists of the experience-mapping card. It is a Philips Design approach as discussed in the report of WP1.1 Section 2.6. The contents of the input card were extracted from the four use cases in the report of WP1.1 and also enriched by local use cases during the preparation phase of the workshop. These input cards of the use cases can be found in the various visual reports of the co-creation workshops (e.g., page G-16 in the visual report of the co-creation workshop at ZZ in Appendix G). The triggering cards consist of

1. Insight cards: these cards were created to describe the user insights of great interests to the local use cases and REACH project objectives. See Figure 3 for an example of the insight cards used in ZZ
2. What-if cards: these cards were created to provide possible questions to stimulate the brainwriting session. These what-if questions were formulated based on the interests of REACH and the needs of the use cases.

A number of templates were created to capture the workshop output. They are:

1. Framing opportunities template: this template was made to identify the design opportunities and formulate the design challenges based on earlier identified user insights
2. Idea template: this template was made to capture the created ideas by specifying what the idea is, why this idea, how it works and what capabilities are needed to make it happen.
3. Experience flow template: this template helps write down any thoughts, feelings and actions one might experience or do by using the designed product or service. One might uncover important aspects of the design that you have overlooked which equally can pose an opportunity as well as a threat. It helps to examine carefully what users of your product and/or service might go through, and document your observation.
4. Service blueprint template: this template was made to describe the different actions that the stakeholders need to take in order to realise the intended services and experiences for the target customers.

The following figures give an overview of the different card templates used in the workshop.

Figure 3. Example of Insight cards, What-if cards

Figure 4. Faming opportunities template (see example at Appendix C page C-12) and Idea template (see example at Appendix C pages C-12 and C-13)

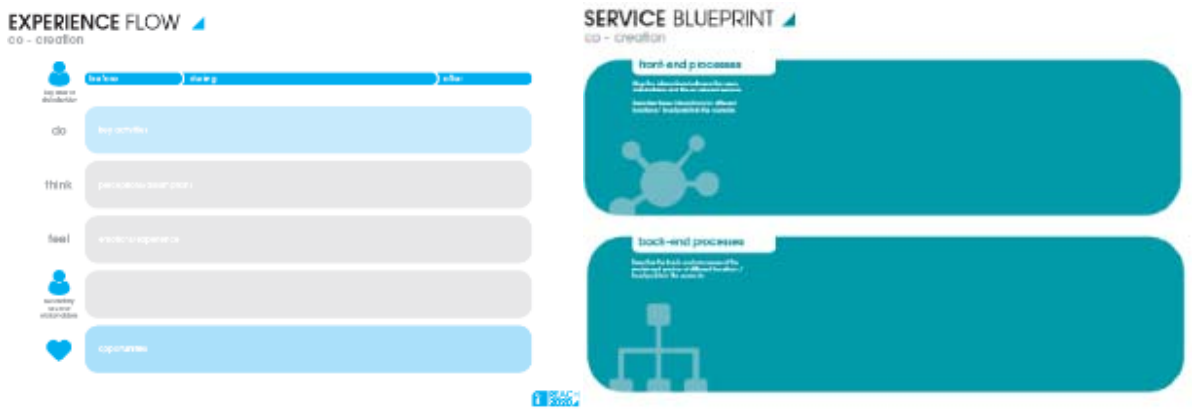

Figure 5. Experience flow template (see example at Appendix G page 48) and Service Blueprint template (see example at Appendix C page C-42)

In addition to the content-related workshop activities as discussed above, in order to have a successful workshop it is important to realise that the design workshop process is very much a social process (Cross and Cross, 1995). It is necessary to align the moods and spirit of the participants and create a trusting and safe atmosphere for the follow-up co-creating activities.

Eventually a list of concepts would be created in the workshop. In order to create actionable items for the upcoming work packages, all concepts would be ranked based on the REACH objective and local use case requirements by individual participants so that the REACH use case concepts and system concepts can be further developed in upcoming work packages.

As a result, the co-creation method used in the PSS creation workshops consists of the following steps:

1. Ice-Breaking
   Creating a trustful and collaborative atmosphere and diverse working teams and getting to know each other
2. Design considerations
   Creating common ground for further ideation based on experience maps and personas from the WP1.1 report for each use case
3. Brainstorming
   Brainwriting in teams, concept selection
4. Stakeholder considerations
   Creating experience flows for all different stakeholders involved in the concepts
5. Business Considerations
   Creating service blueprints for the selected concepts, and defining actions at both front stage and back stage to realise the intended user experiences.
6. Joint reflection and conclusion

A detailed workshop agenda was then created and can be found in Appendix A. The workshop agenda for the different workshops can be found in Appendix C page C-4 and C-34; Appendix E pages E-3, E-44 and E-78; Appendix G pages G-3 and G-44; Appendix I pages I-4 and I-36.

3 Co-creation workshop at SK

3.1 Local context

The vision of SK in the REACH project is to provide a smooth transition for their rehabilitation patients to travel from the rehabilitation clinic back to home. Eventually rehabilitation activities practised at the clinic can be also practised at home and prevent the patients returning to the rehabilitation clinic. The concepts for early warning, intervention, motivation, sensing and rehabilitation will be developed and pre-tested here (in structured environments) before they are implemented outside the facilities in Lyngby in unstructured environments.

3.2 Set-up

The workshop was organised during June 21 and 22 2016 in SK. In total, 9 REACH consortium partners, 3 patients, 3 caregivers, 11 staff from SK and 4 local stakeholders outside the REACH consortium participated in the workshop. The detailed participants' list can be found in Appendix B. Four teams were formulated to work next to each other on the REACH design challenges for SK. Based on the co-creation method discussed in Chapter 2 and the common agenda programme listed in Appendix A, a specific workshop programme was followed at SK, focusing on the specific time and context requirements (see Appendix C pages C-3 and C-34).

3.3 Results

For this workshop a visual report (see Appendix C) was created to share with the participants and used as input for the consolidation workshop. In this section, the actual workshop process is briefly discussed together with the resulting concepts.

3.3.1 Process

The workshop was carried out almost as planned except for one situation. Initially it was expected that the workshop could be organised in English. However, due to the participation of the elderly patients with language deficiency in English, the workshop had to be given in Germany. The core workshop team organisers decided to change the group brainstorm and idea-storm activity in a fishbowl discussion session. The elderly and caregivers were organised together in the centre of the session as the insight-gathering focus group an two ideation groups were organised around to create ideas based on the insights/feedback received from the continuous ping-pong discussion and interaction with the focus group. In this way the input from the patients and caregivers could be used iteratively to develop the intended concepts.

3.3.2 Personas and Experience mapping

Based on the WP1.1 results, one representative from SK presented their personas and experience mapping in the workshop.

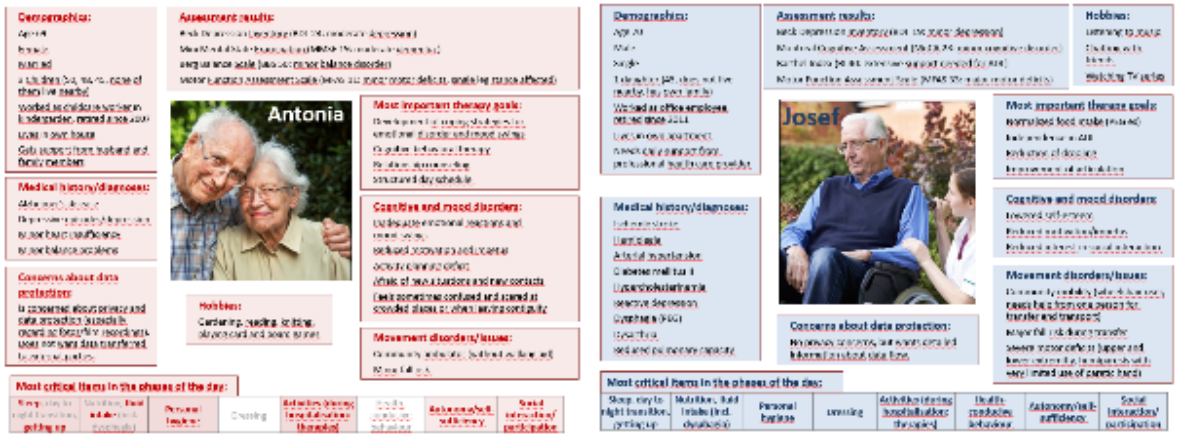

Figure 6. SK personas example (see the report of WP1.1 Figure 14 and Figure 16)

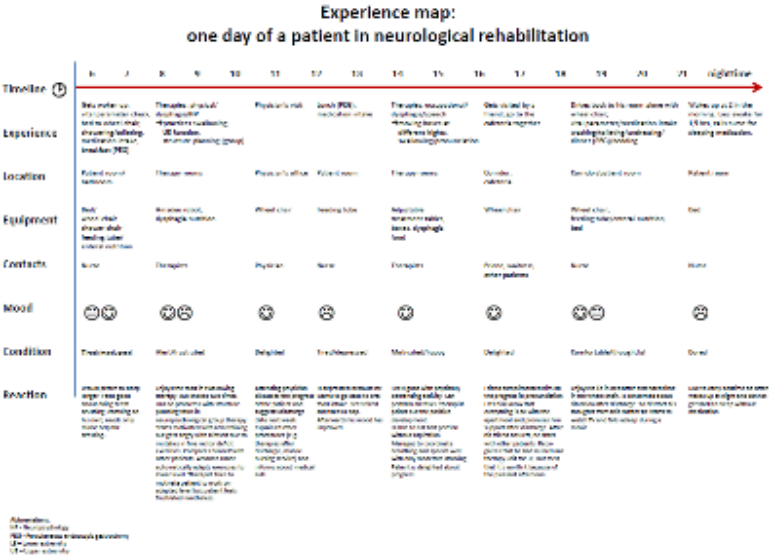

Figure 7. SK experience mapping example (see the report of WP1.1 Figure 18)

These personas and experience mapping were then further enriched by the input from the elderly participants and the caregiver representatives. These enriched personas and experience mapping were used further by different teams to frame the design challenge and create ideas.

3.3.3 Concepts

Many concepts were created in this workshop. Among them, four concepts were chosen as the more preferred concepts by the focus group with patients and nurses. They are

Concept 1 Incontinence prevention (see Appendix C pages C-59, C-60)
Detection when someone has to go to the bathroom through the use of sensing muscle contractions. It includes patient room/environment, beds, mobility devices, the bath/room etc. as physical touchpoints.

Concept 2 Care/Case manager (see Appendix C pages C-42, C-43)
Digital interface, which will put the patient in contact with an expert in the field of rehabilitation and helps the user with for example insurances.

Concept 3 Immobility prevention (see Appendix C pages C-52, C-53)
Smart training equipment, including rewards and challenges for the patient to train at home. Data from this is fed back to nurses and physical therapists. This concept includes the patient room/environment, beds, mobility devices, the bath/room etc. as physical touchpoints.

Concept 4 Development scale (see Appendix C pages C-47, C-48)
Tool to obtain insights into the development during rehabilitation

These concepts were summarised below. This summary was used as an input for the consolidation workshop later.

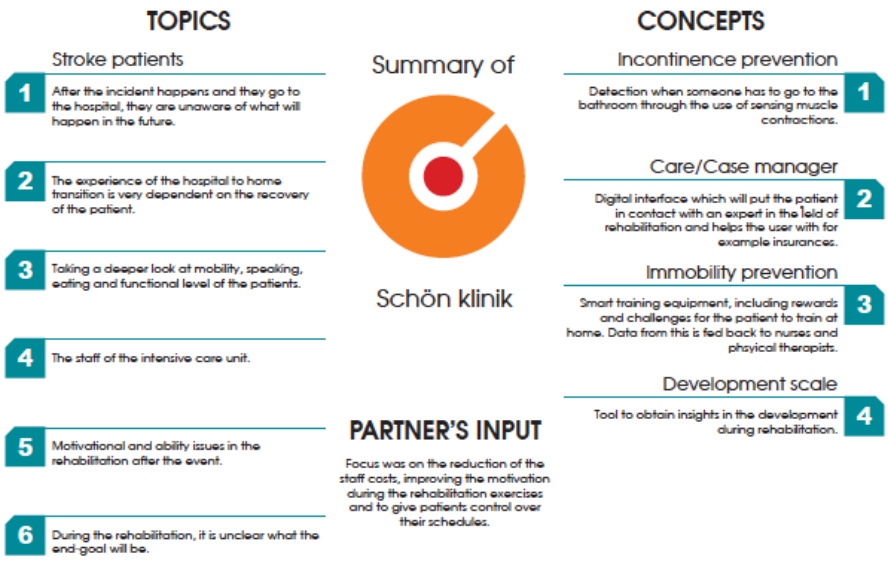

Figure 8. Summary of co-creation workshop SK

3.4 Discussion and conclusion

During the SK co-creation workshop, it was learned that there are many differences in patients, i.e. age, disability condition, level of independence, attitude, social skills, level of education etc. Therefore, it is hard to think about 'the' patient as such. Rather, we should think about grades or scales/spectra in which we can place patients in areas such as physical, social and mental state/ability. Such information is very important in the context of prevention. When we are able to detect individual patients at a certain scale levels (e.g. in frailty, incontinency, immobility, etc.) early enough, we may be able to stop, slow down and/or reverse (rehabilitate) the worsening of the condition.

One thing that illustrates this is that some patients are happy to go home, while others are afraid, and others realise that there is no way back, and so on. Another thing which illustrates this and which we further investigated in the workshop is incontinence/going to the toilet, a number one issue for patients.

The REACH ecosystem describes a high-level vision: within this vision we can place certain modules, or interventions that follow the rules/guidelines within this ecosystem: data

measurement, intervention and further prevention. Therefore, each time we should think about the REACH ecosystem on a separate level than on the intervention level, as the ecosystem is a more holistic approach.

4 Co-creation workshop at Lyngby

4.1 Local context

Lyngby wants people to grow old there and have a good quality of life. Similarly as SK they have a strong focus on the reduction of the professional care costs. To help Lyngby achieve these ambitions, REACH could help by the following.

- Increase safety and security both objectively (measured by incidents, calls, hospital admissions, etc.) and subjectively (measured by experience rating) as hygiene factors.
- Increase cost-effectiveness of care for seniors living in Lyngby, which includes satisfaction measures of the senior, informal care, family and other stakeholders
- Enable and empower Lyngby to provide care which involves health, housework and social support.
- Support Lyngby in realising sufficient touch-points with their senior citizens so they can measure, monitor and motivate them to be active participants of society.
- Leverage the touchpoints to enable stratification, risk identification and incident prediction on a municipality level.
- Early detection of physical inactivity and functional decline and prevention /intervention

According to REACH proposal, Lyngby is the final large demo use case in year four in which the prevention aspects (sensing, prediction, motivation, intervention towards) shall be demonstrated, and therefore concepts from rehabilitation, motivation and intervention used in HUG, SK and ZZ should be to some extent (where applicable) be transferred to Lyngby.

4.2 Set up

The workshop was organized during September 5 and 7 2016 in Lyngby. About 22 people including 17 from the REACH consortium partners, 2 patients, and 3 caregivers from Lyngby participated in the workshop. The detailed participants' list can be found in Appendix D. Four teams were formulated to address the design challenges of Lyngby next to each other. Based on the co-creation method discussed in Chapter 2 and the common workshop programme in Appendix A, a workshop programme was followed at Lyngby given the planning and context characteristics.

4.3 Results

For this workshop a visual report (see Appendix 4-B) was created to share with the participants and used as input for the consolidation workshop. In this section, the actual workshop process is briefly discussed together with the resulting concepts.

4.3.1 Process

The workshop went as expected. The elderly participants primarily participated especially the sessions in the first day to provide extra insights to the earlier defined personas and experience mapping. Some of them were available also on the second day and provided feedback to the ideas that the teams created.

4.3.2 Personas and Experience mapping

Based on the WP1.1 results, representatives from Lyngby presented their personas and experience mapping in the workshop. These personas and experience mapping were then further enriched by the input from the elderly participants and the caregiver representatives. These enriched personas and experience mapping were used further by different teams to frame the design challenge and create ideas.

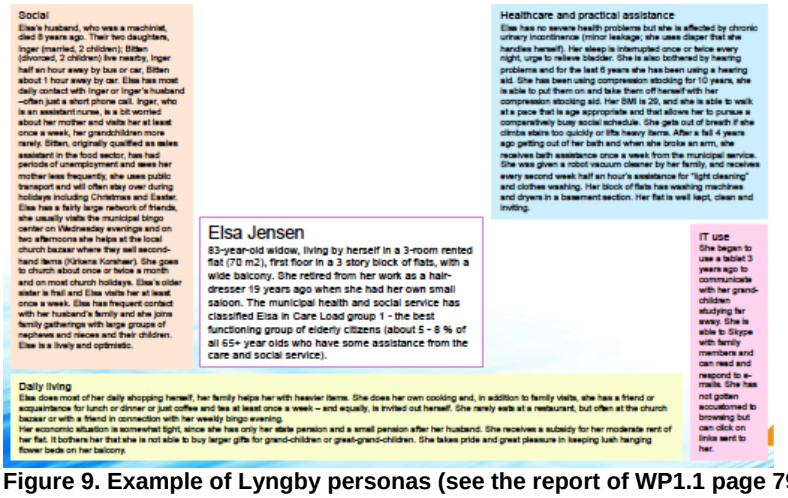

Figure 9. Example of Lyngby personas (see the report of WP1.1 page 79)

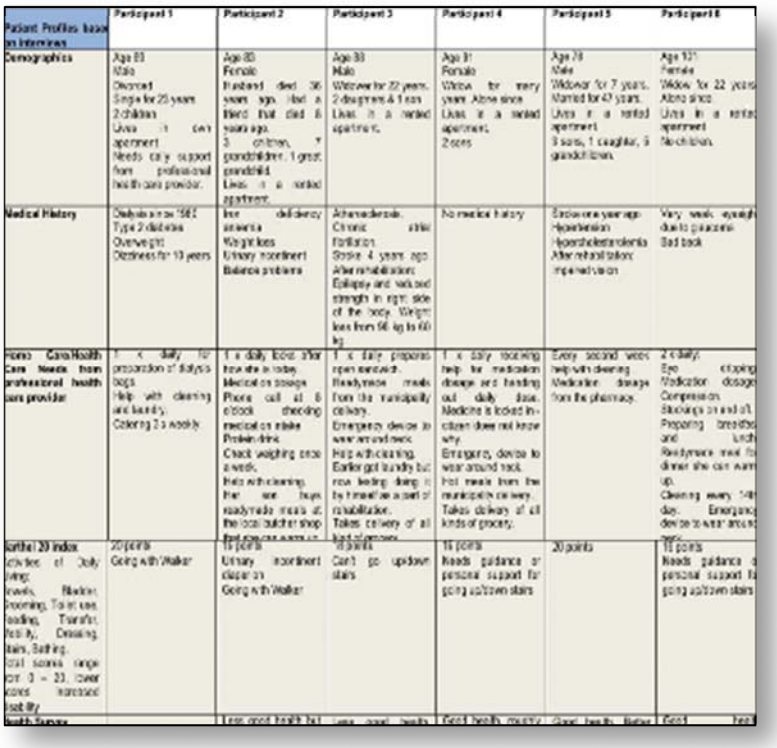

Figure 10. Example of Lyngby experience mapping ((see the report of WP1.1 Figure 32)

4.3.3 Concepts

Many concepts were created in this workshop. Among them 3 concepts were chosen as the more preferred concepts by the participants. They are

Concept: Bathroomie/Magic mirror (see Appendix E page E-72)

A mirror that measures your health subjectively through a spoken diary, answering questions like “How are you today?”. Data is analysed, and unexpected changes give suggestions.

Concept: Get out (see Appendix E page E-77)
Rent a bike, including maintenance, in order to get out more. It will also make sure you know your way home.

Concept: Health coach (see Appendix E, page E-67)
Qualitative and quantitative indicators to show someone’s health level. It also motivates the user to be more active in their daily lives.

These concepts were summarised in the figure below and this summary was used as an input for the consolidation workshop.

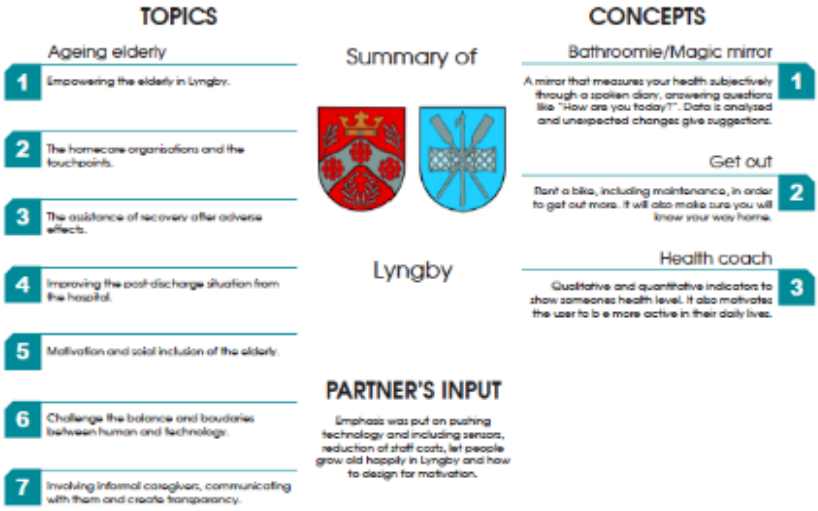

Figure 11. Summary of Lyngby co-creation workshop

4.4 Discussion and conclusion

During the workshop we created a large number of ideas; some were stand-alone concrete ideas, and others conceptual ideas to be explored with technical implementation. A coherent idea space was generated when the teams got inspired by each other and built upon others’ ideas. These final ideas were a result of merging several ideas to create distinct value for the end-user and their stakeholders.

The idea of Bathroomie/Magic Mirror leverages in the moment triggers in key contexts of the user (here in the bathroom: in the morning and at night), to maximise action conversion on planned activities. The team aimed to utilise emotion tracking (gathered by facial expressions and a vocal diary), together with physiological tracking to identify physical and mental health issues, which further relates to activity during the day. A social network was imagined for aggregating activities happening in the area, and the mirror was imagined as a communication medium for pulling out and recommending the most relevant activities to a user at the right times.

Get Out idea addressed the core causes of less activity amongst our target population; fear of getting lost when going out, not feeling safe, and unsure whether they can get back

without being too tired. The team solved this problem with a customised bike and a smart navigational system. The motivational system in place was in terms of rewards by places of interests, motivational games for empowerment (such as a memory game), and reinforcing the feeling of being independent to move around. Further working out these ideas and implementing them can possibly improve the experience of aging for senior citizens, promote sustained prevention of conditions caused by inactivity, allow for diagnosing in an unobtrusive and continual way, and help citizens of Lyngby to be more active to improve their quality of living.

The idea termed as Health Coach was created for both an acute care scenario and a daily living scenario, where a user gets personalised support for promoting activity while keeping caregivers in the loop. To operationalise this idea, the team thought of techniques such as pattern recognition, qualitative data gathering, feedback loop, and applying goal setting and triggering reward-loop in a gamified manner. The team also sketched out the related research questions that need to be tackled, such as: how to distinguish different activities (fall versus resting) using sensor data, how to tackle privacy when installing sensor-based solutions in home settings, and how to implement goal setting and a reward system so that the seniors stay motivated.

5 Co-creation workshop at ZZ

5.1 Purpose

The meet-and-greet centre of ZuidZorg Extra has as its goal to invite the elderly and facilitate activities for them to do. In this way the elderly have a reason to do something during the day and this will give them a community and a sense of belonging.

ZuidZorg Extra works with the values: Hoffelijk, Aandacht, Respect, Thuis and Energie, which roughly translate as: Courteous, Attention, Respect, Home and Energy.

In REACH, ZuidZorg wishes to enable the elderly to be more socially and physically active. This will help them to live longer at home.

5.2 Set-up

The workshop was organised during Sept 13 and 14, 2016, in ZZ. Extra meet-and-greet centre. About 40 people from the REACH consortium partners, the elderly, their formal and informal caregivers, local partners with ZZ Extra, including other care organisations, municipal, insurance companies and physiotherapists, participated in the workshop. Representatives from partner test bed Lyngby were also there as they were interested in learning from this workshop due to the similarity in their target users. The detailed participants' list can be found in Appendix F. Four teams were formulated to address the design challenges of ZZ Extra next to each other. Based on the co-creation method discussed in Chapter 2 and the common workshop programme in Appendix 2-A, a specific workshop programme was followed at ZuidZorg Extra, given the planning and context requirements.

5.3 Results

For this workshop a visual report (see Appendix 5-B) was created to share with the participants and used as input for the consolidation workshop. In this section, the actual workshop process is briefly discussed together with the resulting concepts.

5.3.1 Process

The workshop went as expected. The elderly participants and their caregivers primarily participated, especially during the sessions in the first day to provide extra insights into the earlier defined personas and experience mapping. Some of them were available also on the second day and provided feedback on the ideas that the teams created.

5.3.2 Personas and Experience mapping

Based on the WP1.1 results, representatives from ZuidZorg Extra presented their personas and experience mapping in the workshop. These personas and experience mapping were further enriched by the input from the elderly participants and the caregiver representatives. These enriched personas and experience mapping were used further by different teams to frame the design challenge and create ideas.

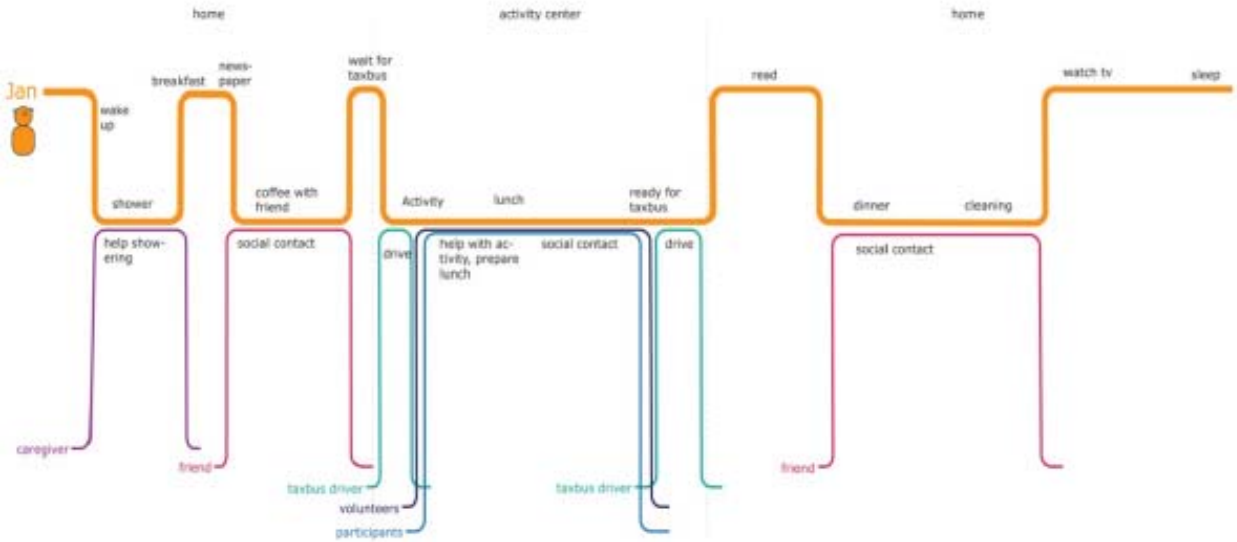

Figure 12. Example of ZZ personas and experience mapping (see the report of WP1.1 Figure 30)

5.3.3 Concepts

Many concepts were created in this workshop. Among them 3 concepts were chosen as the more preferred concepts by the participants. They are:

Concept: Patterns for Patty (see Appendix G page G-84)
Sensors embedded in the home of the user in order to detect irregularities and alert someone accordingly.

Concept: Tupperware 2020/ZZ Car (see Appendix G page G-76)
Introduce technology to the elderly and motivate them to leave the house by bringing the ZuidZorg experience to the user.

Concept: Howdy (see Appendix G page G-80)
Wearable camera, taking frequent snapshots throughout the day as conversation material between (informal) caregiver and patient.

These concepts are summarised below in the figure and this summary was used as an input for the consolidation workshop.

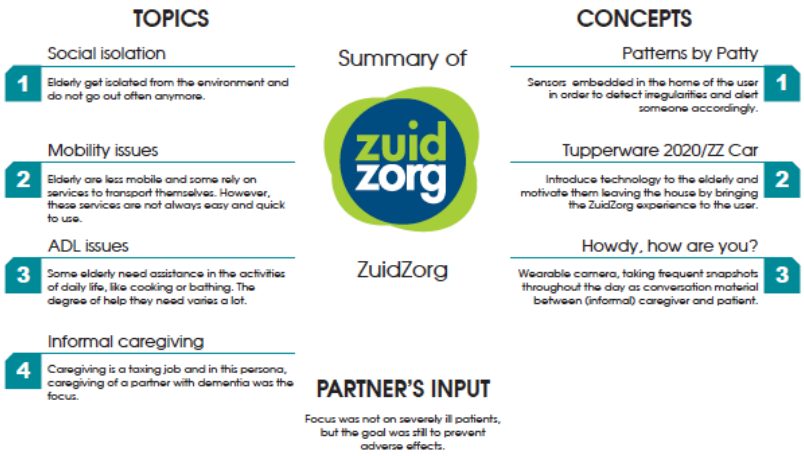

Figure 13. Summary of ZZ workshop

5.4 Discussion and conclusion

During the workshop we created a number of ideas. Those ideas touch upon different aspects of the REACH research. We developed a concept for early intervention, the Tupperware party, for getting the elderly acquainted with technology. This concept can support the elderly in Healthy Life Years. Another concept developed – the Patterns by Patty, as well as Howdy – contain ideas that can be utilised in home/home care contexts to keep people as long as possible in a desired baseline health state, mitigate the risk of deterioration, and finally slow down or prevent deterioration. These concepts can possibly improve and speed up the physical and cognitive rehabilitation of elderly citizens in deteriorated health states or suffering from a sudden incident – for example, by speeding up their transfer from acute care to rehabilitation to home care, as well as their health state improvement within one of these institutions. Other ideas that were not developed further than the phase of an idea template will be used as input to REACH research. Piece by piece they will be evaluated and carefully analysed in terms of their potential.

6 Co-creation workshop at HUG

6.1 Purpose

University Hospitals of Geneva (HUG) are always in pursuit of fulfilling their three missions: providing care, teaching, and research. The HUG are guided by four pillar values, which are Quality, Innovation, Service, and Responsibility. These are all reflected in the extensive internal policy aimed at providing the best safety and efficiency of care.

6.2 Set-up

The workshop was organized during Oct 17 and 18 2016 in HUG. 21 REACH consortium partners, 3 patients, 3 caregivers and 3 local partners participated in the workshop. The detailed participants' list can be found in Appendix H. Four teams were formulated to address the design challenges of HUG next to each other. Based on the co-creation method discussed in Chapter 2 and the common workshop programme in Appendix A, a specific workshop programme was followed at HUG.

6.3 Results

For this workshop a visual report (see Appendix I) was created to share with the participants and used as input for the consolidation workshop. In this section, the actual workshop process is briefly discussed together with the resulting concepts.

6.3.1 Process

The workshop went as expected. The elderly participants participated primarily in the sessions on the first day to provide extra insights to the earlier defined personas and experience mapping. Some of the elderly participants were available also on the second day and provided feedback to the ideas that the teams created.

6.3.2 Personas and Experience mapping

Based on the WP1.1 results, representatives from HUG presented their personas and experience mapping in the workshop (see report WP1.1 pages 34-41). These personas and experience mapping were then further enriched by the input from the elderly participants and the caregiver representatives. These enriched personas and experience mapping were used further by different teams to frame the design challenge and create ideas.

The following text describes one user story related to one of the personas of interests.

Mr. R is a 73-year-old married man with three children. He is living in an apartment with his wife on the fourth floor without elevators. He has three children, who are independent. For ten years he has been suffering from complications of his cardiovascular risk factors (type II diabetes, hypertension and heavy tobacco use). In particular, he suffers from heart failure, coronary artery disease and chronic renal failure.

One month ago, he felt acute breathlessness. It was virtually impossible for him to breathe or to call an ambulance. By chance, his wife was there with him and was able to call for help. It was an extremely scary experience. The ambulance workers arrived in less than ten

minutes, but for Mr. R it appeared to be ages. Quickly they tried their best to reassure him, placed a 100% oxygen mask on his nose, as well as an IV line, and administered medication such as a diuretic. Devices: listed. Caregivers: ambulance workers and spouse.

Mr. R lost consciousness during the transfer to the emergency department. Haemodynamic shock due to acute heart failure was diagnosed, and Mr. R was quickly admitted to the Intensive Care Unit for mechanical ventilation and circulatory support. Under medical treatment, his condition progressively improved, as well as his level of consciousness. However, he felt lost and didn't understand what was happening to him, nor who all the people around him were. All these machines connected to him were impressive and he felt completely powerless. Devices: highly sophisticated ICU equipment. Caregivers: ICU doctors, nurses, physical therapists, cardiologists.

He was then discharged from the ICU and transferred to the internal medicine ward for monitoring and treatment adaptation. There caregivers explained to him what had happened, why he was there, and what remained to be done before his discharge home. He was gaining hope again, but worried about understanding all the new treatments he was supposed to take and how he would be able to manage his new state at home. His wife was also worried for the same reason: she was not sure she could manage all that alone. Devices and lab exams: vital signs measurement devices, weight measurement, regular blood puncture, one cardiac ultrasound and one cardiac MRI. Caregivers: internal medicine doctors, nurses, physical therapists, occupational therapist, cardiologist.

During the discharge, his doctor explained to him what was still to be done (next appointments, most importantly) and to what he should pay particular attention (thoracic pain, breathlessness, weight measurement, treatment compliance and side effects). At first everything seemed to be clear, but he soon realised that many questions arose, giving rise to discouragement and anxiety and preventing him from modifying his lifestyle (a very important part of heart failure and associated risk factor management). Most of all, he didn't want to re-experience the same distress he felt on admission. He was reassured that the caregivers from the IMAD were quite aware of his medical record and were able to assist him properly.

Device: none, except the vital sign measurement tools that the nurses brought during their visit. Caregivers: nurse (IMAD). Informal caregivers: his wife and children, both worried about her husband/father understanding of the situation and treatment and trying to monitor the situation the best they could.

The following figure is an example of the experience flow related to one patient persona with heart failure.

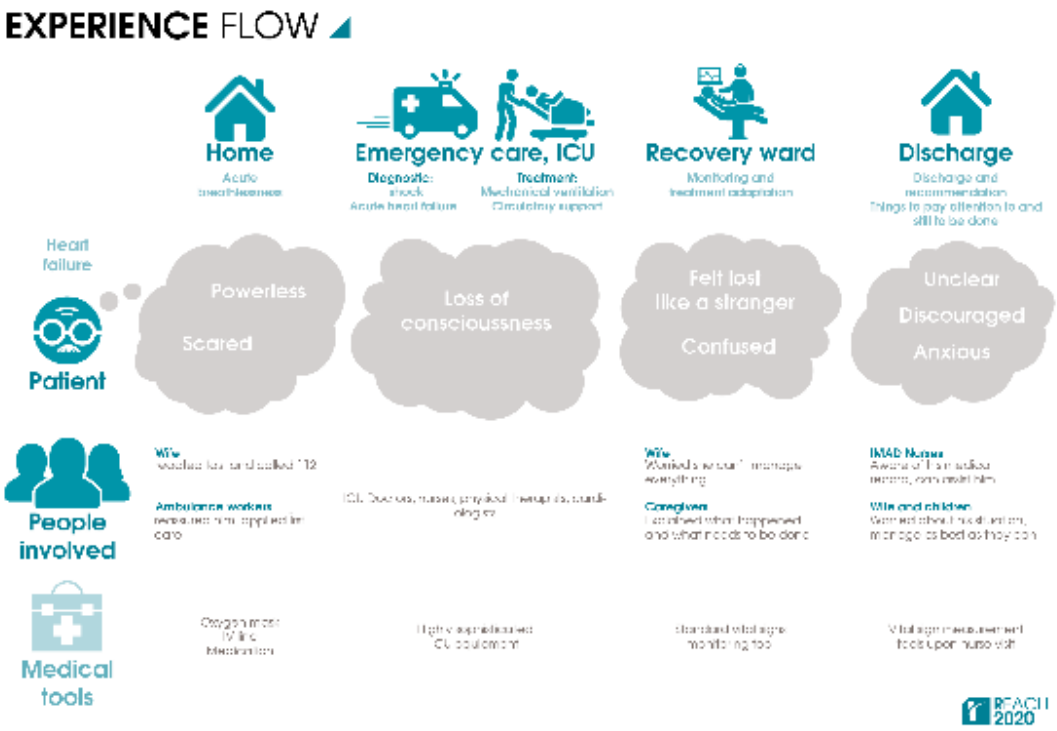

Figure 14. Example of HUG experience mapping

6.3.3 Concepts

Many concepts were created in this workshop. Among them, 3 concepts were chosen as the more preferred concepts by the participants. They are

Concept: WalkStar (see Appendix I page I-53)
Smart walker focusing on people feeling safe when they walk and easy to connect with other people.

Concept: Amanda (see Appendix I page I-56)
Smart documentation in a hospital setting, including data consolidation from home environment and patient record.

Concept: Bring me home bracelet (see Appendix I page I-50)
Focused on people with light to severe dementia to prevent them from getting lost. Aims to prevent confusion through the use of big data.

These concepts are summarised in the figure below. This summary was used as input for the consolidation workshop.

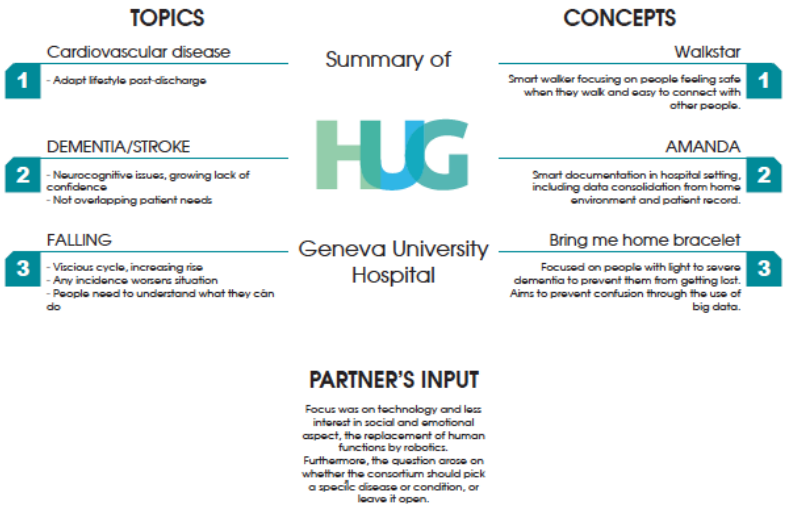

Figure 15. Summary of HUG co-creation workshop

6.4 Discussion and conclusion

During the workshop we created a number of ideas. Those ideas touched upon different aspects of the REACH research. We developed a concept for better physical and social activation of the elderly: the WalkStar. It will help people to walk better with a walker and to make social contact easier.

Another concept that was developed, the Bring me home bracelet, aims to make people with dementia more independent. The bracelet will help demented people find their way home and, through big data, guide them to places they will more likely enjoy and experience with less stress.

The final concept that has been chosen is AMANDA, aiming to assist nurses and doctors in the documentation of the patient file and also let the patient contribute himself to the file through the use of sensors. The information is then visualised in an easy-to-grasp way and highlights possible points of interest.

Other ideas that were not developed further than the phase of an idea template will be used as input to the REACH research. Piece by piece they will be evaluated and carefully analysed in terms of their potential.

7 Consolidation workshop

7.1 Purpose

The objective of the consolidation workshop is to make conscious decisions on which the REACH system and subsystem concepts we should work on together, based on what has been created in the co-creation workshops together at the different use cases and in the business model workshop in TP 8.1 about business models on an EU level, as well as in REACH participating countries. We aim to define the REACH system based on the joint REACH vision and roadmap plan to develop the REACH system step by step in the upcoming project period.

The objectives of this consolidation workshop are:

- **Recap** and **Consolidate**:
  - To develop REACH System Vision, detail use case goals, and further specifying personas
- **Define** REACH system
  - To define REACH system characteristics
- **Understand** our next steps
  - To define the next step plan for each use case and find corresponding partners to collaborate with
- **Work** towards requirements that we will need to build these
  - To create a list of relevant questions to answer in each use case with regard to the defined concepts

7.2 Preparation

In order to be able to carry out the workshop and reach the earlier defined objectives, we needed to make a number of preparations. They are summarised below.

7.2.1 Pre-analysis of the concepts

During the past five months, we have conducted four co-creation workshops at different use cases and created together with the local consortium and stakeholders in total 72 concepts, and the participants chose 13 of them as the winning concepts. The WP1.3 core team has worked on pre-consolidation of these results with the aim to differentiate concepts from system concepts and touchpoint concepts.

Firstly we analysed different concepts informally using the thematic analysis technique. We were able to formulate the following common principles behind all of the concepts

The REACH ‘Engine’

Core functionalities derived from the **top five system-level concepts** generated in the workshops led to the definition of the **REACH ‘Engine'** (cloud-based digital platform/back end) which, according to the concepts created, should do the following:

1. The platform should **process the gathered data** from health and behavioural monitoring to **assess progress in health status**, and to **scan for deviations in users' patterns**, so as to **enable prediction of adverse events** and thereby **providing prevention-focused care services**.

2. The platform should create **profiles** out of user-gathered data and thus be capable of understanding them at an almost individual level.
3. The platform should **apply persuasive and gamification principles** to provide **personalised feedback** to the users, such that the users are **motivated to be more physically, cognitively and socially active**.
4. The platform should **enable** time and context-appropriate **communication between various touchpoints and the user**, throughout their **care journey**, while keeping the formal and informal **caregivers involved**.

The REACH 'touchpoints'

The term 'touchpoint' refers to any **tangible connection between users and the REACH system**. Users not only include senior citizens but also informal and professional caregivers, physicians, therapists, etc.

1. A touchpoint can be a **physical product,** but also a **user interface** delivered through a tablet, for example, which provides users with information, or through which some form of **service is provided**.
2. Services can have both a **digital as well as a human component** to them. Software portals and apps can trigger human intervention as well as communication.
3. Many touchpoints have a **sensing/data gathering component**. Sensing can be conducted through means of touchpoints which are wearable (**on the body**), as well as embedded in the physical environment, potentially as both stand-alone or built into (**embedded in**) physical products.
4. Touchpoints can also have an activating component. By this we mean that the physical device itself may actually 'drive' the user into action: triggering, pushing, nudging, stimulating, encouraging and rewarding, as well as physically supporting the user in some cases.

By examining the 72 concepts using the principles listed above we learned that there were 10 REACH Engine concepts, 58 touchpoint concepts, and 4 outlier concepts. We clustered these 68 concepts into a number of groups according to their focus: therapy, (real-time) health and/or behaviour monitoring, big data prediction and activation, social contact and communication, and empowerment. In the end total 13 winning concepts were chosen (summarized in Table 3). These data can be found in Section 3.3.3, Section 4.3.3, Section 5.3.3 and Section 6.3.3.

Table 3. Winning concepts

	Origin	Design principle		Title	Description
1	HUG	Health and/or behaviour monitoring	Big data prediction and activation	Amanda/Intelligent reporting for caregivers	Tailored data sharing between hospital, caregiver and patient, enabling easier diagnostics, detection of possible pain points, and the visualisation of data.
2	Lyngby	Health and/or behaviour monitoring		Bathroomie + Magic Mirror	Bathroom mirror collects data from you: for example, from facial expressions, and analyses it.
3	SK	Social contact and communication	Education	Care/case manager	The contact person who will help you with the transition from hospital to home, including the legal information that is necessary.
4	ZZ	Social contact and communication	Education	Coffee car + Tupperware 2020	Car drives around, lowering the threshold to get in contact with the people from ZuidZorg. At the car they can join activities such as health condition monitoring.
5	SK	Health and/or behaviour monitoring		Development scale	Status and progress of the rehabilitation process are visualised.

6	Lyngby	Big data prediction and activation	Social contact and communication	Get out	Motorised bikes with GPS and monitoring system.
7	Lyngby	Health and/or behaviour monitoring	Big data prediction and activation	Health level	Complete understanding of one's own health based on measurements.
8	ZZ	Social contact and communication		Howdy?	Photos are taken throughout the wearer's day, giving the user and the partner something to talk about when someone has become less talkative due, for example, to dementia.
9	SK	Therapy		Immobility prevention	Tailored training programmes to prevent immobility. The patient will have the same type of training equipment at home as in the hospital.
10	SK	Health and/or behaviour monitoring		Incontinence prevention	Sense with bio-sensors when someone needs to go to the toilet.
11	ZZ	Big data prediction and activation		Patterns by Patty	Warns the user when they start to deviate from their usual habits.
12	HUG	Big data prediction and activation	Social contact and communication	Take me home bracelet	Smart bracelet that helps people with dementia or mild cognitive impairment to find their way home. It also includes data gathering, so it will alert people when they are more likely to get lost or confused.
13	HUG	Big data prediction and activation	Social contact and communication	WalkStar	Smart walker that is adjustable and monitors the way you walk. It also includes the possibility to meet other WalkStar users and be connected with them.

Among these 13 concepts there are 5 REACH Engine concepts and 8 REACH touchpoint concepts. The REACH Engine concepts are Care Case Management, Patterns by Patty, Amanda, Development Scale and Health Level. The REACH touchpoint concepts are Magic Mirror, Howdy, Bring me home, Immobility Prevention, Incontinence Prevention, Coffee Car, Get Out! and Walk Star. These concepts will be used further in the workshop.

7.2.2 Pre-analysis of the personas

When analysing 16 personas in different use cases, we identified 4 leading personas which are valid across the REACH platform. They are:

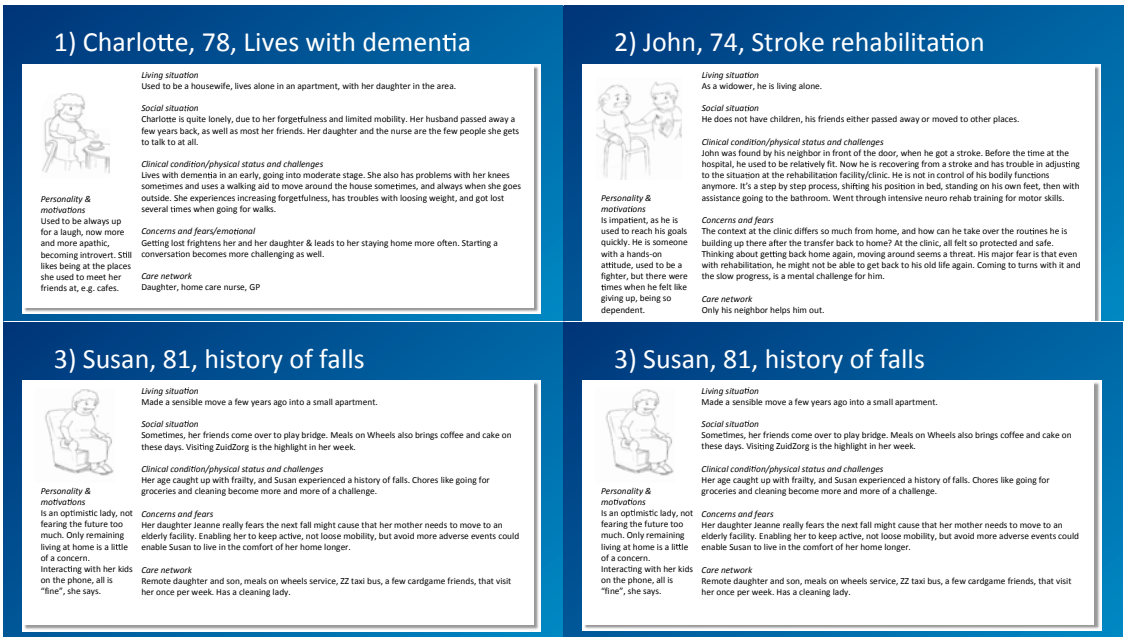

Figure 16. Consolidated REACH personas

These personas will be used as input for the consolidation workshop.

7.2.3 Identifying core REACH components for service blueprint consolidation

Service blueprint is a very useful technique used often in service design to provide an overview of what the customer experiences in the service process and help different employees/ organizations to relate what they do to realise the entire, integrated service system (Shostack, 1984; Bitner et. Al, 2008). By bearing service blueprint in mind, and reviewing the REACH proposal and the key components of the resulted concepts, we have identified a number of core functional elements of REACH: to measure, monitor, promote and activate. The REACH should on the one hand, continuously measure the user activities in the front end, while at the back-end monitor the processes and identify/predict acute events and unusual patterns for potential activations by the system or caregivers at the front-end experience of the user again.

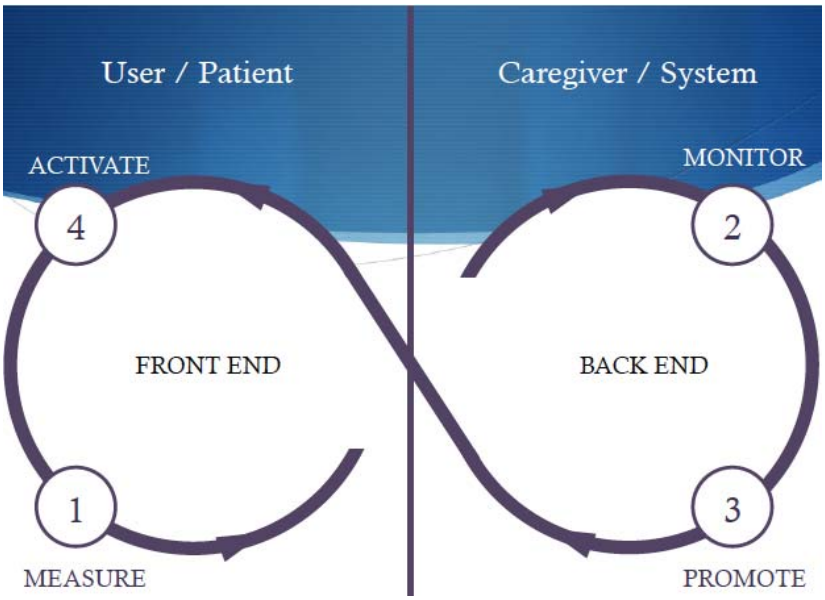

Figure 17. REACH core component in service blueprint

In the workshop we aim to develop the winning concepts further based on these elements and make them more REACH-aligned.

7.2.4 Set up

The workshop lasted for two days on Nov 10-11 2016 and the detailed programme is listed below. The participants include researchers from TU/e, DTU, TUM and Fraunhofer and industrial partners from Biozoon, Alreh Medical, Arjo Huntleigh and Philips Design. The signed participants' list can be viewed in Appendix J.

Nov 10, 2016
08:30-09:00 Walk in and coffee
09:00-09:30 Short introduction, ice-breaker and question download
09:30-10:30 Poster trade market
10:30-11:00 Break
11:00-12:30 REACH system-level discussion and vision definition
12:30-13:30 Lunch
13:30-14:30 Define objectives, needs/vision per testbed

14:30-15:00 Persona REACH journey
15:00-15:30 Break
15:30-17:00 Concept/intervention consolidation per testbed – integration + identify gaps with status quo – share with each other what we are doing
17:00 End of the day reflection

Nov 11, 2016
08:30-09:00 Walk in and coffee
09:00-10:30 Develop testbed product-service-system service blueprint
10:30-11:00 Break
11:00-12:30 Roadmap/Action plan – what are the next steps?
12:30-13:30 Lunch Break
13:30-15:00 Give-and-take relationship – commit to a certain action
15:00-15:30 Break
15:30-17:00 Fishbowl discussion – ecosystem and gaps
17:00 End of the day reflection

7.3 Results

A visual report was created to describe the results of the workshop in detail (see Appendix K). Below we will focus on the main results and the concluding activities.

7.3.1 REACH manifesto

After the first day discussion on REACH vision, the team managed to agree upon the REACH manifesto below.

We, all the partners of the REACH consortium, believe supporting the elderly to be active, and to increase Quality of Life and reduce healthcare costs.

To do this, we are building REACH, which is a cloud-based solution that measures, monitors and motivates the elderly to be and feel confident, active and empowered.

Our aim is to build an ecosystem of sensing devices, interpretation and predictive algorithms and interventions that support, enable and motivate seniors in clinic, care homes, their own homes, and in any transition between these locations.

Through REACH, we intend to move healthcare from:

- generic solutions to individually tailored planning and interventions
- single-location solutions to seamless integration of products and services across the care journey
- manual assessment to intelligent, integrated and data-driven solutions to provide even more personalised care.
- innovation silo's to EU-wide and multidisciplinary collaboration between academic institutions, industry partners and care and government organisations.

7.3.2 REACH Engine and touchpoint concepts

In this section we will discuss the resulting REACH Engine and touchpoint concepts and activities. The figure below demonstrates how REACH Engine concepts connect REACH

touchpoint concepts at different REACH test beds. As indicated, REACH Engine/touchpoint systems are modular and can be flexibly combined and/or cross-transferred between different test beds. The engine/touchpoint concepts discussed in this section are in the initial situation and will be later cross-transferred to other test beds if appropriate. All developments together will finally comprise the reach kit which is able to serve different value propositions and business models at different test beds. During the different test beds time was also taken to connect the earlier concepts with their current REACH development activities. In this way, concepts from different test beds were further fine-tuned and detailed. The resulted REACH touchpoint concepts and engine concepts are listed below.

Figure 18. Illustration of REACH Engine and touchpoint concepts cross different testbeds

REACH touchpoint concept

In the following REACH touchpoint concepts at different testbeds are summarized in four tables. The intended opportunity is discussed, followed by the solution and its connection to REACH engine.

Table 4. Touchpoint concepts at SK

Concept	Opportunity	Solution	Connection to the REACH Engine
Incontinence prevention / training	Patients suffer from the feeling that they need to go every 30 minutes and cannot distinguish. In other cases, patients will not sense the upcoming need, and they will not have time enough to make it to the bathroom (also due to physical problems).	The core idea is to utilise a body-worn sensor to detect bladder movements/bladder behaviour, which can help the patient/nurse recognise the genuine need to go to the toilet. Also the sensor could feed a prediction algorithm to prevent future toilet accidents by alerting patients and staff in time.	Body-worn sensors feed the REACH Engine data on (in)continence-related parameters. Based on pattern identification, locations of staff, profile of the patient, etc., the REACH Engine's algorithms choose the appropriate intervention and message to patients and staff.
Active environment	Due to physical problems, patients need a lot of care to be able to get up from bed, and they often remain in one position for a long time and need help to move around. They participate in different	By combining three different types of sensors – 1) sensors for vital signs; 2) sensors for location and activities; 3) sensors for posture – different layers of feedback will be created to provide, on the one hand, real-life feedback at the clinic to ease up on the care activities,	The above-mentioned sensors feed the REACH Engine data on (in)activity-related parameters. Based on pattern identification, locations of staff, profile of the patient, etc. the REACH Engine's algorithms choose the appropriate intervention and

	rehabilitation activities in different locations within the clinic. How can we stimulate them to be moderately active within their span of control?	and on the other hand, predictions and suggestions based on integrated data collected from different sensors for a period of time. The sensing and feedback will take place either in the beds in the patient rooms, in the bathrooms, or on a large interactive interface or mobility device.	message to patient and staff.

Table 5. Touchpoint concepts at HUG

Concept	Opportunity	Solution	Connection to REACH Engine
Rehabilitation gaming platform/HUG @ Home	In addition to physiotherapy using the Alreh dynamic stander, other forms of exercise will be provided making use of an IR camera-based (Kinect type) gaming platform.	Exercises involve upper-body physiotherapy (e.g. stretching arms, reaching), as well as cognitive exercises using the same interaction mechanism (e.g. arithmetic, memory). Exercises might be conducted whilst standing (with or without support), as well as whilst seated. The platform could be used to introduce a Skype call with a human therapist. The therapist would have an overview of the patients exercises/progress, etc.	Using what is known about the performance and potential of a patient, the gaming platform would easily be able to select the right training, beyond only looking at past gaming performance. In addition, the user performance in the game can be both input on other topics (i.e. "point at the food you had today") as well as further measurement for psychomotor performance for the REACH cloud.
Nutritional intervention/Food intake program	Part of the therapy programme issued upon discharge from hospital can include a 'nutrition package'. In consultation with a nutritionist the patient is prescribed a digital programme/weekly diet which can be viewed on a tablet or internet TV.	*(@Home)* The patient is asked to self-report on their actual food intake via the gaming platform. This information is presented back to an app or web portal 'My Diet'. The patient's nutritionist/doctor can also view this data. The app analyses the input and deduces compliancy with the diet plan, e.g. salt, sugar. The app presents this information back to the patient and can generate recommendations or eating tips based on the analysis e.g. 'your salt intake is high above average; your five high salty foods are …. In order to reduce salt intake, try ….'. The app can be used in connection with a nutritionist/prescribed diet or stand-alone starting with inventorying the individual's current diet. Data fed back to Biozoon will enable them to provide customised dietary food and/or supplements	Once food intake is administered in the REACH cloud, it is known what the energy intake is of an individual. This can be compared to energy expenditure (wearable activity data), sleep data, etc., to better understand how patients could improve their daily living habits and routines to optimise their activeness.
		(In-patient) Whilst inside hospital, patients are in a controlled environment. Their food intake can therefore be easily closely monitored. Nevertheless, a digital system would need to know: • The patient • The actual food that was presented to the patient during the day • Its nutritional value, size of portion, weight, volume • What was actually consumed (or what was left). Would weighing provide a suitable approximate indication? The patient's stay in hospital could provide an opportunity to learn about food preferences, likes/ dislikes/habits of the patient.	Administered food intake can be compared to planned and past energy expenditure. In a hospital/rehab clinic in particular, it is possible to know the activity, and plan future activities of patients. Energy intake can become a part of understanding why and how people (will) perform, as well as enabling the caregiver to stimulate the proper behaviour (more activity, more food, more rest, etc.)
Dynamic stander/HUG @ Home	To enable patients to be sooner discharged from hospital to home.	Alreh Medical proposed to introduce their dynamic stander. This enables patients to perform physical therapy exercises without the supervision of a	The stander will have sensors integrated to monitor a patient's performance. If the stander is not one's own personal device, it will be

		therapist. It will in some way promote and monitor their usage/exercise with the device. Upon discharge a patient will be recommended a daily therapy programme which the patient will be encouraged to follow.	able to identify an individual. Over time (days, weeks) the performance and usage data is recorded in the REACH cloud to facilitate future planning, and identify fall-backs. Also, it may be used to identify which kind/type of activity promotion is most effective for a particular individual.
Cardiovascular physiology workout	Heart patients discharged from hospital are informed how important it is for them to modify various aspects of their lifestyle behaviour. One major recommendation is to become more physically active. Patients worry, however, about the recurrence of another event: they are uncertain about their own limits and fear overexerting themselves.	The patient wears a T-shirt with embedded electrodes which are attached to a SmartCardia ECG device. Maximum HR levels are determined by the patient's doctor/cardiologist. In the event that this level is reached during exercise, the patient is alerted immediately and cautioned to take a break. Coupled with measurement of breathing, the data which is sent to the REACH Engine can be analysed by the experts to determine the level of fitness, and the patient's exercise programme adjusted according to progress. Vital sign measurement can be correlated with measures of the actual exercise itself (via dynamic stander or wrist-worn activity tracker). This system incorporates some form of 'digital dashboard' (app or web portal) which displays the user's vital signs data alongside their physical activity data.	The solution measures cardiac activity, and compares it to maximum cardiac load. This short-term and closed loop feedback becomes even more relevant when measuring activity and physical load over time. This can then include energy expenditure, food intake and rest patterns to form a complete picture of (ab)normal behaviour or performance. In addition, it will help the caregivers to have the right background data to convince/persuade patients to change behaviour.
WalkStar	Once a patient progresses from the use of a dynamic stander there are a number of additional REACH TOUCHPOINTS which can be used to measure and to promote physical activity.	WalkStar is a walker equipped with embedded/modular add-on sensors. It can be used both indoors and outdoors. Not only does it generate data itself (location, distance travelled) but it also gathers data about its user (walking speed, stability, grip strength and even heart rate). WalkStar also incorporates a number of assistive elements; electro motor-driven wheels (e-bike) which can support the user (climbing inclines, braking when going down a steep incline, setting a pace when walking). A simple GPS can support the user in finding his/her way/home. Programmes can be downloaded which follow predetermined routes; these could be group outings, community-sponsored events, special locations, local parks or community centres. WalkStar is open to expandable opportunities.	The WalkStar as a touchpoint must be able to recognise which patient is using it at which specific time, allowing for daily activity levels of the user to be tracked and recorded. NFC-enabled wrist bands worn by patients for identification purposes will be used together with a reader on the device to personalise the settings for each user and record personal data to the REACH cloud system.
Playware	Once a patient has had an incident, i.e. stroke or fall, their walking abilities may decrease. How can they be helped in gaining confidence in a playful manner?	Playware is a set of interactive floor tiles which both sense the presence of someone walking on them and also promote and/or respond when the user moves from one tile to another using built-in illumination. Used as a form of rehabilitation exercise, Playware tiles encourage users to perform exercises ranging from assisted walking to dance-type movements. In hospital, one application could be the measurement of mobility using a timed up-and-go test, or testing of the individual walking speed and gait of the user.	In a clinical multi-user setting, again the system will need to recognise which user is interacting with the Playware device. This could be achieved through a sign-in procedure on a connected tablet system or through NFC ID tag check in points. The collected data should be aggregated within the REACH system engine and be adapted over the period of use in order to progress and challenge the individual in their personal rehabilitation activities.
		Within the hospital, a second application could be a stationary measurement of balance and posture	During the initial stages of the rehabilitation process nurses can provide the solution to patients who

		incorporating a series of balance exercises. This could be something installed at the foot of the bed when one first stands up in the morning or in front of bathroom mirror where the wash basin (hand bars) can provide additional support whilst exercising. .	are progressing as a way to encourage and reassure them in getting out of bed and back on their feet. Data collected from the tiles will show daily activity and also provide alerts to a caregiver to show that the patient is up and out of bed. Feedback and coaching for balance and posture exercises could be relayed to the patient in a number of ways, either through a colour change in the LED tiles or from a separate connected device such as a tablet or screen.

Table 6. Touchpoint concepts at ZZ

Concept	Opportunity	Solution	Connection to REACH Engine
Pattern Detection I	Due to decreasing mobility and physical capability, elderly people have a tendency to remain physical inactive. This can lead to social isolation and health deterioration. An ZZ meet-and-greet centre offers many social activities that can help to improve social connection and physical participation. How to motivate elderly people to participate and what should be organised are some of the interesting opportunities identified.	Users will score feedback on how much they enjoy particular activities – adding to their personal profile. ZuidZorg will analyse such data and this will enable them to develop improved and more personalised/targeted programmes, grouping people together in close neighbourhoods, with similar interests, etc. Back at the Activity Centre, repeated assessments will be conducted and activity measures collected from the wearables. Progress will be presented back to the users in the form of light-hearted scoreboards (gamification) illustrating how well individuals are meeting their individual targets and/or comparing individuals or teams, giving out awards etc.	Presentation of data and feedback on activities could utilise the interactive aspect of the 'Cognitive Training' concept. Interactive projectors placed in the ZZ centre could bring a more fun and social element to the feedback process. Data from the wearables will need to be collected and downloaded to the REACH system engine by ZZ care workers, meaning the process will need to be simplified and a solution designed to dock numerous wearable devices at once.
Pattern Detection II	Due to decreasing mobility and physical capability, elderly people have a tendency to remain physical inactive. This can lead to social isolation and health deterioration. An ZZ meet-and-greet centre offers many social activities that can help to improve social connection and physical participation. How to motivate elderly people to participate and what should be organised are some of the interesting opportunities identified.	Additional touchpoints can be added to the wearable and the in-house assessment tools: At home, users will be offered a 'smart cushion' which is simply installed in their favourite armchair/sofa. This will transmit 'sitting' data to the REACH Engine. This is expected to provide some kind of measure of: • Sedentary behaviour • Sitting posture • In home activity • At home/not at home The idea is that ZuidZorg might make use of this data to stimulate users to become more physically active. In the meet-and-greet centre the physiotherapist might utilise this data to further promote the need for joining in the physical activity programmes and events. Another part of the idea is to empower the individual: hence the home-user might also just receive targeted messages informing them that they've been sitting indoors for too long, it's a nice day, and they really should go out. The idea could be extended to a kind of 'dating' game whereby multiple users are triggered to go out to the same place at the same time.	When the smart cushion is in use, it has to know who is sitting on it. This can perhaps be done in the future by the recognition of how people sit and where their balance lies through machine learning. It then needs to transmit the gathered evidence to the REACH Engine, which can be done through Wi-Fi or through a REACH HUB that connects to all the touchpoint devices in the environment.

Pattern Detection III	Due to decreasing mobility and physical capability, elderly people have a tendency to remain physical inactive. This can lead to social isolation and health deterioration. An ZZ meet-and-greet centre offers many social activities that can help to improve social connection and physical participation. How to motivate elderly people to participate and what should be organised are some of the interesting opportunities identified.	Additional touchpoints can be added to the wearable and in-house assessment tools: at home, users will be offered a 'smart exercise ball'. When used in front of an IR camera (HUG2) and TV, the user can follow a series of gamified guided exercises using the smart ball. These exercises in themselves might also be 'prescribed' by the ZuidZorg physiotherapist. Exercises involve not just moving the ball but also stretching, bending, holding the ball in a stationary position, etc. (yoga-like). Exercises can be done whilst standing or whilst sitting. The ball and TV will both provide combination of guidance/instruction as well as feedback/motivation to the user.	Users will have a personalised account that they can log onto when they use the system. The graphical interface will make the interaction easier. The data that is gathered through the game (i.e. reaction speed, precision and balance) can, similarly to the smart cushion, be transmitted directly to the ENGINE or via a REACH HUB.
Cognitive Training	Due to decreasing mobility and physical capability, elderly people have a tendency to remain physical inactive. This can lead to social isolation and health deterioration. An ZZ meet-and-greet centre offers many social activities that can help to improve social connection and physical participation. How to motivate elderly people to participate and what should be organised are some of the interesting opportunities identified.	Small groups of users sit around a table at the ZuidZorg meet-and-greet centre. Above the table is mounted a projector and camera in the form of a lamp which beams an image onto the surface. Users can interact with this image directly by touching the table surface. The idea is that games and exercises are projected which involve the users socially and cognitively. The camera can detect the number of people sitting around the table, and adapts the game play accordingly. Games include simple memory-type games using images or colours, etc. Quiz games can be played with answers presented as options which the participants must choose from – the fastest response wins. Puzzles are presented which require manipulation of different images. Without being aware of it, the games are designed to encourage users to use both hands and stretch their reach.	The system should be able to recognise each individual sitting at the table. It remembers their performance and brings this into the next session (leader board, etc.). In this way the system can also track the capabilities/changing patterns of the users and feed this back to a care professional. The game performance may be a parameter for cognitive performance as well as social activeness, which may be used by other services running on the REACH cloud.

Table 7. Touchpoint concepts at Lyngby

Concept	Opportunity	Solution	Connection to REACH Engine
Tailored activity tracker/nudger	To enable Lyngby inhabitants to grow old happily and independent in the comfort of their own home.	To increase the autonomy of residents living in the Lyngby municipality they will be subject to a combination of wearable and in-home monitoring sensors. Data gathered in relation to daily mobility both in-home and outdoors will formulate and feed back the activity level of the user, whilst in-home and on sites around the municipality, check-in stations or in situ sensors will monitor where the residents have been. When this data is presented to caregivers, alongside the scheduled activities within the municipality, it will allow tailored interventions specific to the needs/preferences of individual users. During daily visits caregivers can then suggest activities based on personal preference, external conditions and past activity to better activate immobile residents in more 'meaningful' daily activities.	Modular NFC reading devices can be adapted to fit the various settings across the Lyngby municipality, for both the home and activity centres. NFC tagged wearables will allow users to check into certain areas, meaning residents won't be 'tracked' in the sense of GPS, but a caregiver can see the locations they have frequented and whether the levels of daily activity have been conducted within their own homes or outside. Along with NFC check-in data, the activity level readings from the wearables (e.g. Fitbit) must be aggregated within the REACH system where each person's data can be accessed and viewed in combination.

REACH Engine concept

In total 4 REACH Engine concepts were developed. They are summarized below.

Testbed	REACH Engine concept
SK	Care case manager: It is a digital interface supported by a rehabilitation-monitoring data platform. By employing different sensors used in the SK touchpoint concepts mentioned earlier, useful insights can be identified to provide personal rehabilitation support to individual patients by professional experts – via distance, for example.
HUG	Amanda: By using different sensors in hospital and at home, a smart documentation, including data consolidation from home environment and patient record, can be generated to help identify patterns, and to provide feedback to patients and professional caregivers for motivating better care services to address the specific conditions of the patients.
ZZ	Patterns by patty: By using sensing-based monitoring in the home context to detect irregularities in daily activities and alert someone accordingly. Sensors include those used in the different touchpoint concepts discussed earlier. It aims to stimulate physical activities, increasing social participation and cognitive training. In return, it contributes to the social, physical and mental well-being of the elderly and empowers them to remain living independently.
Lyngby	Health coach: By using sensing-based monitoring, ADL data are collected for three different purposes: to detect unintended events; to identify deviation from daily activities; and to nudge and create intervention. By using different sensors such as Fitbit and Playware, the concept will stimulate more physical exercises, as they are the best and cheapest medicine for the elderly.

What these Engine concepts share in common is that

- There should be a basic platform in which different sources of data can be collected, analysed, aggregated and stored safely
- Intelligent algorithms are needed for real-time pattern detection, generating feedback, recommendation and planning.

After the discussion, the team identified three major core concepts among these concepts. They are Invisible Dr., Out & Active and Re-habit

Invisible Dr.
An **integrated service** in the **living environment** that non-invasively **monitors** the elderly's vital signs and health level, and **notifies** caregivers when deterioration is detected. It is a **communication** platform between the elderly and caregivers, and an **insightful platform** for the elderly to understand data regarding their health **from the REACH Engine**.

Out & Active
A range of **products** which **motivate, reassure and support the** elderly in their **everyday activities**, to keep them **active** and help them **get out of the house** and **stay independent**.

Re-habit
Supporting the elderly to create and maintain **healthy habits and routines**, feel **confiden**t and safe in their living environments to **rehabilitate** after/during the transition from hospital/rehab to **home**. Providing **tangible, physical and mental support** and rehab to the elderly.

Invisible Dr. is obviously a REACH Engine concept, while Out &Active and Re-habit are the REACH touchpoint concepts. The table below indicates how these REACH touchpoint concepts and Engine concepts relate to these core concepts.

8 Discussion and conclusion

Based on the results from the co-creation workshops and consolidating workshop, 1 REACH Engine core concept and 2 REACH touchpoint core concepts were created. They will be further developed in following WPs. Not only concepts but also associated development teams need to be created to start the REACH development work. Therefore, the core WP team worked further on summarizing and consolidating these concepts, derived plans and defined small teams within the REACH consortium to continue the REACH system and subsystem development. The tables discussed below provide an overview of the results achieved in close connection with the follow-up work packages.

Table 8 below lists a number of key characteristics of the REACH Engine concept Invisible "Dr." Firstly four clusters of concepts are identified based on the common characteristics of the REACH Engine concept as mentioned in the previous chapter: data collection and storage, pattern detection, feedback, recommendation and planning. Then the related concepts with the primary functions are explained corresponding to the intended user needs and use cases. Eventually the follow up technology development leader(s) are proposed as well as the development team.

Table 8. REACH Engine concepts, their key characteristics and development

	Invisible "Dr."				
	Engine Concept				
	E1	E2	E3	E4	E5
Key Engine concept clusters	Safety Feedback/Control	Pattern Detection	Interface and Recommender	Care and Life Planning	Platform and Data Gathering and Storage System
Concepts	Health coach	Patterns by Patty	Amanda (HUG)	Care case manager	REACH platform basic functionality
Concept premise - what it does primarily	Monitor Data on location and condition of the patient and provide feedback	Detection of alarm-situations, deteriorations and pattern deviations that indicate either health concerns, or changes in activity regime.	provide recommendation and feedback to patients and professional caregivers based on specific conditions of the patients at home and in hospital	Support in understanding and access to health data, healthcare touchpoints and treatment procedure for the patient	Safe and secure storage of data collected through the REACH touch points.
Key need addressed	lack of physical activities due to unawareness of daily activities and potential risks	lack of physical activities due to unawareness of daily activities and potential risks	lack of overview of patient progress	desire to have better care and life planning for patients as well as for professional caregivers	need to be able to collect different activity and location data safely and securely

Initial use case setting(s) - *please note "initial" use case setting. Touchpoints may be (where relevant) transferred to/used in later project phases on also in other use case settings!*	Lyngby, ZZ	Use case ZZ, Lygby	HUG, SK	HUG, SK	all use cases
Initial use scenario/personas	personas 3 and 4	personas 3 and 4	personas 1 and 2	personas 1 and 2	all personas
Development Leader	Fraunhofer	Fraunhofer	EPFL	Fraunhofer	EPFL, Fraunhofer, SC, TUM
Development Team members	ZZ, Lygnby, HUG, SK, TU/e, Philips, DTU				

Table 9 lists the main characteristics of all REACH touchpoint concepts from the consolidation workshops. Firstly these concepts are clustered according to the different user needs that they address including: personal mobility device, active environment, nutritional monitoring and intervention, gaming and training system and wearables. These concepts are then further analysed according to their user needs, initial use cases and targeted personas. In addition, the key base products available at the consortium partners that can be used to develop these concepts are identified.

Table 9. REACH touchpoint concepts, their key characteristics and development

Primary stakeholder network and use case	Home	Hospital	Home	Hospital	Home	Hospital	Home	Hospital	Home	Hospital
Core concept name	Out & Active	Re-habit	Out & Active	Re-habit	Out & Active	Re-habit	Out & Active	Re-habit	Out & Active	Re-habit
Touchpoint clusters	**Personal Mobility Device**		**Active Environment** (key elements: Bed, Mobility, Bathroom)		**Nutritional Monitoring and Intervention** (including Table, Chairs/Cussions, smart Cups, etc.)		**Gaming & Training System**		**Wearables**	
Touchpoint concepts	Walk Star (HUG), Dynamic stander (HUG)		Incontinency Prevention (SK), Active environment (SK),		Nutritional intervention / Food intake program (HUG)		Cardio physiology work out (HUG), Playware (HUG)		Take me home bracelet (HUG), Howdy? (ZZ), Walk Button (Lyngby), Health Level (Lyngby) etc.	
Key need addressed	Patients need to be as mobile/active as possible in a safe and confident way, without placing additional burden on staff.		Staff and patients need a safe way to mobilize, as to prevent decubitus and support training. (Not sure how incontinency fits in here).		Social activities and eating as part of that, are considered key in motivating people to stay active. Any innovation that supports those is important.		Most rehab and activity exercising equipment delivers tedious and repetitive training. More motivating and engaging activity tools may increase activity and training compliance.		For various use cases (incontinence, dementia/wandering, training planning) it is relevant to know the location of an individual. The absence of the data currently means loss of confidence and searching staff.	
Concept premise - what it does primarily	provide personalised support when walking and standing up		prevent incontenency, support stand up, getting out of bed, going to bath room, doing exercises while sitting and etc.		Patients can self-report on food behavior through engaging interface. Food interventions can be provided. Food order and reported intake is tracked and stored in REACH cloud.		The concept provides clinically valid training exercises in a more engaging and motivating way. Coaching is provided as to increase intrinsic motivation.		A location device provides the data to the REACH cloud. It works indoors and outdoors, and is equipped with a panic button.	

Initial use case setting(s)	Lyngby & ZZ	HUG & SK	Lyngby & ZZ	HUG & SK	Lyngby & ZZ	HUG & SK	Lyngby & ZZ	HUG & SK	Lyngby & ZZ	HUG & SK
Initial personas	Personas 1, 2, 3		Personas 1, 2, 3		all		all		all	
Initial product base	AM's walker/stander		AH's equipment (beds, chairs, bathroom/toilet furniture, etc.)		TU/e' & TUM's prototypes, Biozoons customized food, etc.		Playware Tiles, AM's gaming system, large interface TU/e + TUM, TU/e prototypes, etc., Ahs first rehab developments		SC's sensor	
Development Leader proposal	**AM**		**AH/TUM**		**Bio Zoon**		**TU/e, Philips, DTU**		**SC**	
Development Team proposal(mainly)	AM, TUM, HUG, SC, Philips?		AH, TUM, AM, SK, Philips?		TU/e, TUM, Biozoon, SC, Philips		DTU, AM, AH, TUM, TU/e, Philips		SC, TUM, TU/e, SK, DTU, HUG, Lnygby	

These two tables provides an overview of

- what the intended functionality of the different concepts are corresponding to the key user needs
- what the initial use case and personas are
- how they can be connected with the products available at our core technology development partners.

These analyses aim to help the project consortium to form sub-development teams with focus on REACH touchpoint concepts at specific use cases and REACH Engine concepts. In this way, the detailed activities and responsibilities for upcoming WP1.4, WP2 and WP3 can be further specified with engineering development discussions with the technology leaders. The participating use cases will serve as the development panel to secure the relevance of the engineering development to the user needs and contexts. At the moment the WP1.4 team is following up on the results of the consolidation workshop and further specifying the functional requirements of the REACH touchpoint and REACH Engine concepts. Eventually, the development leaders as well as the development team members will collaboratively ensure the continuous transfer of WP1.3 results to WP1.4, WP2, WP3 and etc.

WP1.3 has offered a very busy and fruitful period for the project consortium. Coming from different expectations with diverse expertise, the consortium was able to arrive at a number of agreements that the local testbeds could work on further with the related partners. The consolidated results and defined follow-up activities can help WP1.4, WP2 and WP3 to further specify the requirements and technical specifications and develop the technical systems, and provide input to WP8.1 on defining REACH business model for each participating country.

It should be mentioned that the co-creation method to support multi-stakeholder ideation was new to many consortium members. The interactions enabled by this method including many workshops, meetings and discussions helped the partners to understand the different professions and expertise where they are coming from. Especially with the REACH touchpoint concepts, REACH Engine concepts, and REACH core concepts, a common language was developed, on the one hand, to communicate what REACH is about, on the other hand, to define what the follow up REACH development focus is.

Whereas this deliverable (T1.3/D3) focused on the (bottom up) detailing of the overall concept and value proposition with the stakeholders, the in parallel executed task/deliverable T1.2/D2 focused more on the analysis and testing of the tools and approaches (motivational strategies, stakeholder networks, sensors/algorithm approaches, early testing of first strategies) that will be used to implement the overall concept in the form of the touchpoint/ engine functionality targeting the prevention, slow down and reversing of functional loss. In T1.4/D4 of both overall concept and implementation tools towards the overall REACH system architecture will be outlined. Also in parallel the group of partners involved in WPs 2 and 3 (sensing/monitoring) started to work (also as part of T1.4) on detailing concept and functionality for the REACH ICT platform/engine which represents the backbone for the physical touchpoints and system architecture. Furthermore, the WP 8 (T8.1/D33) group in their work on novel REACH business model concepts considered in their work, the work and progress made in WP1. The WP10/D34 group complementarily flanked the ongoing concept and system architecture detailing by analysis and development with regard to REACH privacy, data security, and data management approaches.

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Appendix

8.1 Confidential Appendices of Deliverable T1.3/D3 (A-K)

The following appendices of this deliverable were considered as confidential and therefore were integrated as “Appendix 7” into the linked Deliverable T1.4/D4 (confidential deliverable).

8.1.1 Appendix A Co-creation workshop agenda

8.1.2 Appendix B Participant list at SK

8.1.3 Appendix C Workshop visual report at SK

8.1.4 Appendix D Participant list at Lyngby

8.1.5 Appendix E Workshop visual report at Lyngby

8.1.6 Appendix F Participant list at ZZ

8.1.7 Appendix G Workshop visual report at ZZ

8.1.8 Appendix H Participant list at HUG

8.1.9 Appendix I Workshop visual report at HUG

8.1.10 Appendix J Participant list at consolidation workshop in Eindhoven

8.1.11 Appendix K Consolidation workshop visual report