D1.1.2
Final user-centered design

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Task	**T1.2 Use Case Specifications**
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Summary	As user involvement in the innovation process must result in a better fit between the needs and products for people living with dementia (Topo, 2009), the Playtime-network makes use of a user-centered design to develop a serious game for people living with dementia. The aim of this research is to explore the added value of the user-centered design in the network, and to explore where in the social innovation process (serious game development) the (perceived) added value can be found. To this end, semi-structured interviews were conducted with all partners of Playtime and with people living with dementia who were involved in the first field study of the project. The results indicate that added value is created by developing a serious game for people with dementia while following a user-centered design and that value is created throughout the whole social innovation process.

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Contents

1 Executive Summary

As indicated by Hanson et al. (2007), developed services and products for people living with dementia are often not aligned with the needs and possibilities of these people. In order to match new or improved services/products for people living with dementia (and their informal caregiver) and their needs, the Playtime-network makes us of a user-centered design while developing a serious game for people living with dementia (Bongers, Snaphaan & Geerts, 2018). User involvement in the innovation process must result in a better fit between the needs and products for people living with dementia (Topo, 2009). Therefore, the Playtime-network makes use of a user-centered design to develop a serious game for people who live with dementia. As a result of this matter, the aim of this research is to explore the added value of the user-centered design in the network, and to explore where in the innovation process (serious game development) the (perceived) added value can be found. The following research question addresses this matter:

"What is the perceived added value for the participants in the playtime network when using a user-centered design to develop a serious game for people living with dementia?"

This research was explorative and qualitative in nature. Furthermore, semi-structured interviews and observations were used to collect the data. After the data was collected it was analyzed by using conventional- and direct content analysis. The results indicate that added value is created by developing a serious game for people with dementia while following a user-centered design. Value is mostly created as game development in this manner will lead to a better fit between the product and the needs and desires of the end-users, network participants become more motivated, more conscious and multiple perspective design decisions will be made, correct interpretations will be made, the development process is more effective, no major relapse will be encountered and continuous learning emerges amongst the network participants. Although the results show that a user-centered design cannot be ascribed to only one phase of the social innovation process stated by Murray, Caulier-Grice & Mulgan (2010), they indicate that the design must be incorporated throughout the whole social innovation process, as the value is created throughout the whole process and not only in one or two phases.

Key words: *user-centered design, user involvement, dementia, social innovation, network, serious game.*

2 Introduction

In 2010 over 35 million people around the world suffered from dementia, and according to the World Health Organization this is expected to increase to over 115 million people in approximately 40 years (WHO, 2012). Nowadays the world population is aging, and as age is positively correlated with dementia, Zhang et al. (1990) stresses that the relevance of dementia in modern society is growing. Studies follow this perception due to the exponential increasing in healthcare costs (Alzheimer's Association, 2015; Joling et al., 2015), the negative effect dementia has on the quality of life for patients' and their network (Schölzel-Dorenbos, 2011) and due to the fact that dementia is an increasing cause of death (Starr, 2017). As more people become demented, new and/or improved services and products which facilitate living at home are required and these services and products often are not aligned with the needs and possibilities of people living with dementia (Lauriks et al. 2007).

Understanding the daily context of the desired end-users in the development process of new products or services is essential to carter to their complex needs, and the acceptance of the innovation (Topo, 2009). Schumacher and Ferustein (2007) stated that end-user involvement during the innovation process reduces business risks such as lack of product acceptance. Furthermore, user involvement of people living with dementia in the innovation process of products or services lead to services or products that better fit their needs (Robinson et al., 2009; Topo, 2009). Therefore, a shift between supply driven innovations and demand driven innovations has occurred, where the focus is more on the demand (end-user) perspective (Topo, 2009).

The Playtime-network strives for a user-centered design during their innovation process in which they develop a serious game for people living with dementia. The need to evaluate and develop innovations as an essential part of the home context of people living with dementia motivates the use of the Living Lab approach for the Playtime project. (Bongers et al., 2018). This living lab approach can be seen as physical regions or virtual realities where multiple stakeholders from public-private-people partnerships of public agencies, firms, users, universities and institutes, are all collaborating for creating, prototyping, validating and testing new technologies, products, services and systems in real-life contexts (Bergvall-Kåreborn et al. 2009).

The literature describes little involvement of people with dementia in user-centered design studies, but when adequately prepared they are perfectly capable to do so (Suijkerbuick, Brankaert, Kort, Snaphaan & Den Ouden, 2014; Whitlach & Menne, 2009). As indicated above the gap between innovation developers and the end-users can be breached by developing user-centered. According to Van den Abeele et al. (2012), products will be more appropriate, usable for the target audience, and will be better accepted by them, when developed in a user-centered manner. As the developers, focus more on the needs and desires of the end-users instead of developing a self-referential product or service. However, as the literature describes little involvement of people with dementia in user-centered product development, it is not clear what

the added value of such a design might be for the Playtime-network. Will this development design be beneficial for the network incumbents and thus add value or will it harm the final product and network-members. Focusing on the context of the Playtime network, it is not clear if any added value can be subtracted from the design and in which phase of the social innovation process from Murray et al. (2010) this added value unfolds. Due to the lack of understanding of people with dementia in a user-centered social innovation, the investigation of any possible added value of the design for the Playtime network participants bears relevance for the dementia field.

The research question that addresses this matter is as follows:

"What is the perceived added value for the participants in the playtime network when using a user-centered design to develop a serious game for people living with dementia?"

3 Theoretical framework

All theoretical concepts will be briefly elaborated in this chapter.

3.1 Added value

Activities can be perceived as value added or non-value added. Activities may increase the value of a product, service or design to the client, and where a client is willing to purchase such an activity, value is added (Ashworth & Hogg, 2014). Kinnear and Bernhardts' (1986) definition of added value will be used in this research, they state that added value is not quantifiable and can be translated as a consumer benefit. Companies make their product, service, design or system more convenient to use, thus adding value for the consumer (Kinnear & Bernhardt, 1986; Asworth & Hogg, 2014). This research will follow this definition, because its focus will be on the usefulness of the product and not on the added price value. This indicates that value can be seen as perceived use value, where value is subjective and defined by customers, based on their perceptions of the products' usefulness (Bowman & Ambrosini, 2000). When following Bongers et al. (2018) added value in the Playtime network consists of usability, feasibility, appropriateness and acceptability. Where usability indicates the degree to which Playtime is fit to be used, feasibility whether the network deals successfully with the development of Playtime, appropriateness implies if Playtime is suitable in the context where it will be used, and acceptance means if Playtime is tolerated, accepted or allowed by the end-users (Bongers et al., 2018).

3.2 Network

Following the social innovation and living lab point of view, the Playtime network can be characterized as a co-exploration network, this indicates that the goal of the network is to create new knowledge and value creation takes place through innovation (Parmigiani & Rivero-Santos, 2011). The network type that characterizes Playtime is that of a chain collaboration, as a result of the added value which is contributed by its incumbents can be perceived as complementary resources. A chain collaboration as stated by Goedee and Entken (2013) proposes that there is an agreement between the various (network) partners to jointly deliver a product and/ or service. The chain collaboration can be characterized as a client-focused one, where the client (end-user) influences the value chain and the network operates throughout an outside in perspective (Goedee, 2017). In this research, the Playtime network consist of the following stakeholders: Geestelijke Gezondheidszorg Eindhoven en de Kempen (including healthcare professionals and clients), Tilburg University (Tranzo), Famel, Sozialverein Deutschlandsberg, MindBytes, Ghent University, McRoberts and Joanneum Research (Bongers et al., 2018).

3.3 Social innovation

According to Baregheh, Rowley and Sambrook (2009) an innovation is a multi-stage process whereby organizations transform ideas into improved or new processes, services or products, in order to differentiate, compete and advance themselves successfully in the market place.

The attributes of an innovation also appear in a social innovation, but not fully cover its meaning (Cajaiba-Santana, 2014). A social innovation stresses the productions of outcomes, which are oriented on the needs of society (Mulgan, 2006; Moulaert, 2016; Cajaiba-Santana, 2014). Secondly, it is crucial in a social innovation that end-users and other relevant stakeholders participate within the process to develop, implement and adopt need-driven innovations (Bekkers et al., 2013). The end-users ensure that initial needs are represented in every stage of the innovation process, and can be seen as a process of co-creation (Bason, 2016). The social innovation process contains of six phases (see figure 1.) and is an iterative process wherein new insights and feedback loops change the innovations' nature (Murray et al., 2010).

The six phases are as follows, the prompt phase where the need for change is explored; proposal phase where initial plans are developed; the prototype phase where pilots inform the innovators through trial and error points; the sustaining phase, where the innovation becomes everyday practice; the scaling phase where the innovation will be spread and this ultimately leads to systematic change (Murray et al., 2010). At last, a social innovation leads to fundamental changes of relationships between stakeholders', because co-creation encompasses collaborations between stakeholders from different sectors and end-users (Bekkers et al., 2013).
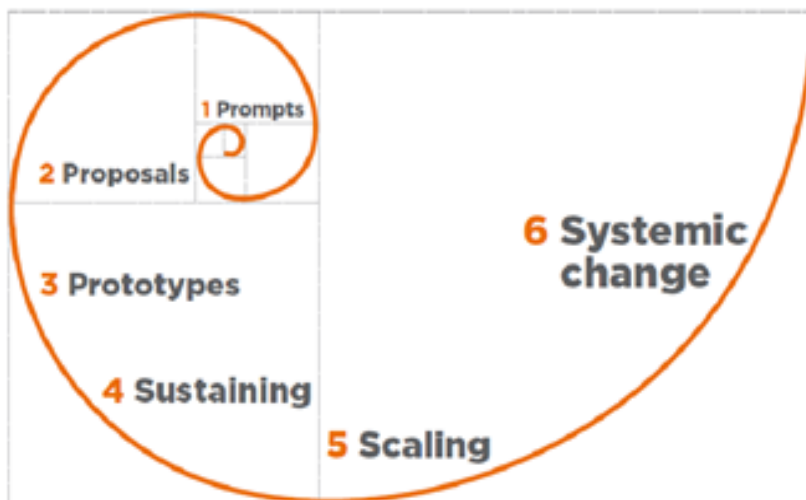

Figure 1. Social innovation spiral

3.4 User-centered design

User-centered design is an iterative process, where the goal is the development of usable products, services or systems, achieved through involvement of potential users of a product, service or system in system design (Karat, 1996). With the term 'users' the people who will use the final artefact, product or service to accomplish a task or goal will be addressed (Abras et al., 2004). Whether a systems' design can be characterized as user-centered depends on multiple 'key' principles and their attached sub-principles (Gulliksen et al., 2003), these are elaborated below

1. The work practices of the users control the development

User focus - All members of a project must understand the goals of the activity, who the users are, the context of use, goals and tasks, their situation, why and how they perform their tasks, how they cooperate, interact and communicate (Gulliksen et al., 2003; Gould et al., 1997; Ebner & Holzinger 2007; Pancake, 2016; Dabbs et al., 2009).

Simple design representations an terminology – the design must be described in such a manner that it can be easily understood by all the stakeholders, and especially by the users (Gulliksen et al., 2003; Kyng, 1995).

2. Active user participation throughout the project

Active user involvement - Representative users should actively participate, continuously and early throughout the whole development process (Nielsen, 1993; Gulliksen et al., 2003; Dabbs et al., 2009).

Explicit and conscious design activities – the development process should be result of professional interactions as a structured and prioritized activity and thus contain dedicated design activities (Brown & Coopers 1999; Gulliksen et al., 2003).

3. Early prototyping to evaluate and develop design solutions

Early and continuously prototyping – prototypes should be used to evaluate and visualize design solutions and ideas in cooperation with the users (Nielsen, 1993; Gulliksen et al., 2003; Pancake, 2016). This early prototyping will support the creative process and helps the designers in maintaining a creative and open attitude to what is being built (Gulliksen et al., 2003; Pancake, 2016).

Evaluate use in context – Critical usability goals should be specified and the design must be based on specific design criteria, in cooperation with the users these criteria and goals should be evaluated within the users' context (Gulliksen et al., 2003).

4. Continuous iteration of design solutions

Evolutionary development – the development must be both iterative and incremental (Gould et al., 1997; Gulliksen et al., 2003; Pancake, 2016; Dabbs et al., 2009). The iteration should consist of a proper analysis of the users' context of use and their needs, a documented evaluation with concrete suggestions for changes, and a redesign which is in congruence with the results of the evaluation (Gulliksen et al., 2003; Pancake, 2016).

5. Multidisciplinary design teams

A professional attitude – the development process should be executed by multidisciplinary teams/ networks. Therefore, a professional attitude is required and so are the tools that ease the efficiency and cooperation of the team (Gulliksen et al., 2003).

Usability champion –This usability expert is the engine of the process and should be devoted to the development. They lead the others toward matters affecting the usability of the product, service or system and towards future situations (Buur & Bødker 2000; Gulliksen et al., 2003).

6. Integrated design

Holistic design – all parts/ components that influence the future use situation should be developed in parallel (Gould et al., 1997; Gulliksen et al., 2003). All parts of the context of use such as physical and social environments should be taken into account in the integrated design process.

Process customization – the user-centered design must be adaptor/ implemented in each organization, which is part of the network. So, activities could be added, removed or modified to fit the user-centered design (Gulliksen et al., 2003).

Finally, a user-centered design attitude should always be established – all stakeholders involved, must be aware of and committed to the importance of user engagement (Boivie, Carpenter & Maruyama 2003; Gulliksen et al., 2003).

A user-centered design facilitates the deeper understanding of organizational, social, psychological and ergonomic factors that emerge from the user involvement of the end-users at every phase of the evaluation and design of the product, service or system (Abras et al., 2004)

3.5 Living lab

The user-centered design here indicates a Living Lab approach, this can be seen as physical regions or virtual realities where multiple stakeholders from public-private-people partnerships of public agencies, firms, users, universities and institutes, are all collaborating for creating, prototyping, validating and testing new technologies, products, services and systems in real-life contexts (Bergvall-Kåreborn, Hoist & Stahlbrost, 2009; Bongers et al, 2018). Particularly, it looks at collaboration between stakeholders during social innovation stages. Identified building blocks regarding living lab approach are evaluation, co-creation, context research and user role. (Veeckman et al., 2013).

Evaluation

This refers to the ability given to end-users to evaluate the innovation. This can be done through, for example focus groups, surveys or in-depth interviews (Veeckman et al., 2013).

Co-creation

This refers to ways user feedback is captured. This can differ from no interaction with users at all, to iteratively capturing almost everything of the user feedback. Moreover, it takes into account to what extent users' feedback leads to alterations or modifications of the innovation (Veeckman et al., 2013).

Context research

The extent to which usage context influences usage behavior, e.g. the actual conditions under which a product or service is tested. Ways of incorporating usage context are through the use of diaries, surveys or more advanced techniques as observations or ethnography tools (Veeckman et al., 2013).
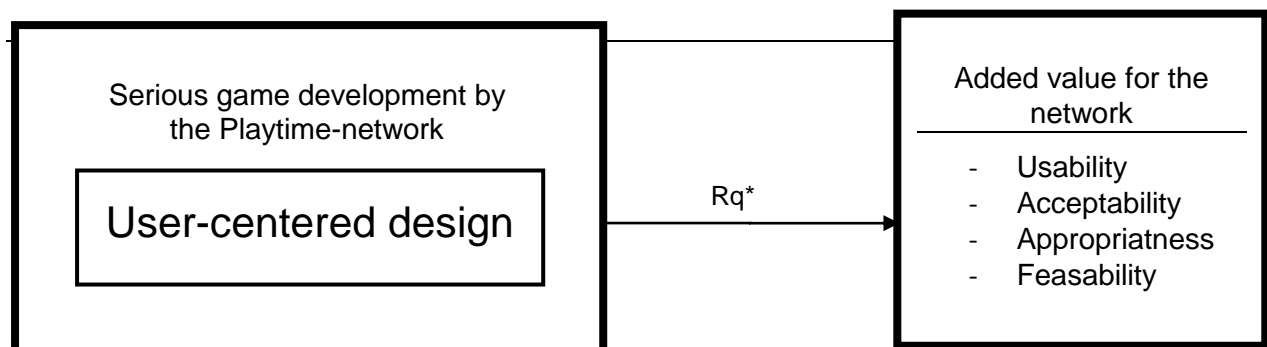
User role

This describes different user-roles performed by users during the innovation process. The distinctive roles are tester, co-creator, contributor and informant (Nyström et al., 2014). This study does not take these user-roles in consideration.

3.6 Serious game

Serious games are gaining more and more interest as an instructional instrument, capitalizing on the attraction of games and the effectiveness of communication and information technologies (Arnab et al., 2015). The concepts of learning and gameplay are frequently conflicting, but when a serious game is well designed, they can coexist (Huynh-Kim-Bang, Labat & Wisdom, 2011). The above suggest that high-level pedagogical intents can be implemented and translated through lower-level serious game mechanics (Arnab et al., 2015). A serious game is a game in which education (in all its forms) is the goal of the game, rather than entertainment (Michael & Chen, 2006). In a serious game is the reality simulated through the interaction of role players using formal and non-formal symbols, computerized sub-models where necessary. The technique allows participants to engage in collective action in a safe environment where they can create, experience and analyze the futures they want to explore. It enables the participants to test initiatives in a realistic environment (Jansen, 2017). Serious games are used, because of the increasing complexity of real systems; the multidisciplinary approach of serious games is essential for cross fertilization of relevant ideas and research between natural and social sciences; the evolution of complex social systems depends if it capability for adaption and innovation, flexibility, and creation of newness; and the system also requires communication and feedback mechanisms to utilize the input from the environment (Goedee, 2017).

3.7 Conceptual model


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┌──────────────────────────────────┐            ┌──────────────────────────┐
│  Serious game development by     │            │   Added value for the    │
│     the Playtime-network         │            │        network           │
│  ┌────────────────────────────┐  │            │  ─────────────────────   │
│  │                            │  │    Rq*     │   -  Usability           │
│  │  User-centered design      │──┼───────────▶│   -  Acceptability       │
│  │                            │  │            │   -  Appropriatness      │
│  └────────────────────────────┘  │            │   -  Feasability         │
└──────────────────────────────────┘            └──────────────────────────┘
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*RQ= Research question

The research question is graphically presented above. First, user-centered design will be mapped by means of the principles suggested by Gulliksen et al. (2003). This is part of the overarching frame of ''serious game development by the Playtime network''. Where the development indicates the first three phases of an social innovation proposed by Murray et al. (2010), and the Playtime-network consist of all the participants (briefly mentioned in the introduction). At last, added value can be perceived as the combination of usability, acceptability, appropriateness and feasibility.

4 Method

This section will clarify the design of the research, the sample strategy, how the data is collected and analyzed.

4.1 Research design

This study can be characterized as an explorative case study, this design is chosen for the potential of in-depth understanding of the social innovation process in which a serious game will be developed, and the potential added value of the user-centered design in the case. As a result, this research will be of a qualitative nature as there is a wide consensus that qualitative research is an interpretative, naturalistic approach concerned with the understanding of the meanings which people attach to phenomena within their social worlds (Ritchie, Lewis, Nicholls & Ormston, 2013). The unit of observation in this study will be done at the individual level, by conducting eighteen semi-structured interviews with the network-project participants. On the other hand, conclusions will be drawn at the case level, which consists of a multi-stakeholder project-network. Therefore, the unit of analysis will be on the network level, as the added value of the user-centered design in the social innovation process will be evaluated by the participants, as no single perspective can provide a full explanation for the research problem (Lewin, Long & Carroll, 1999). 17 december smiddags/ 20 december smiddags 7 januari/ 10 januari.

4.2 Sample strategy

This research contains one population including strategy, and one sampling strategy. This research aimed to have interviews with all of its incumbents and made use of a purposeful strategy based on Kuzul (1992). This strategy indicates that the interviewees will be approached on the base of the purpose of this research, thus to find out what the added value is of a user-centered design to develop a serious game in the Playtime network. Therefore, this research aimed to have interviews amongst its network incumbents in as rich as possible manner. Unfortunately, due to language barriers (not all network participants spoke English or Dutch), scheduling problems (some network participants simply did not have sufficient time) and due to the fact that some network-members were not actively involved (were not present at each meeting), it was not possible to include all of the incumbents. To hold on to capture a maximum perspective variation the scholar aimed to have interviews with at least two representatives of each network participant group (Healthcare professionals, Knowledge Institutions, End-users and Businesses). This resulted in twelve interviews with representatives of all the organizations and six interviews with the end-users. Regarding the sample strategy to include end-users, the researcher made use of convenience sampling. As a result of the fact that the researcher was involved in the focus groups, and Playtimes' living labs, the interviewees were approached face-to-face. (Goodman, 1961). Beneath an overview of the respondents who were interviewed and their participant classification.

Participant name	Short name	Participant type	Country	Number
Joanneum Research	JRD	Knowledge Institution	Austria	2
FameL	FAM	Business	Austria	2
Sozialverein deutschlandsberg	SVD	Healthcare professional	Austria	1
GGzE	GGZ	Healthcare professional	The Netherlands	1
Tilburg University	TIU	Knowledge Institution	The Netherlands	3
McRoberts	MCR	Business	The Netherlands	1
People living with dementia	PWD	End-users	The Netherlands	6
MindBytes	MBY	Bussiness	Belgium	1
Ghent University	GEU	Knowledge Institution	Belgium	1

Table 1. Interviewees classification

4.3 Data collection

The data was collected throughout semi-structured interviews. The interviewer conducted semi-structured interviews as the source of data collection as a result of its potential to explore motivations, views and experiences of the network incumbents. The interviews will not be completely structured due to the variation of interviewees. Therefore, there will be a general set of questions to define the key areas which will be explored, but this also will allow the researcher to pursue or response in detail to particular network incumbents regarding different topics. Therefore, the core of the topic list consisted of the user-centered design principles combined with the concepts added value and social innovation phases (Appendix I and II). The scholar made use of two topic lists, due to the lack of knowledge and insights in some of the user-centered design principles of the clients. This was due to the fact that clients did not posess enough knowledge regarding the multidisciplinarity of the team and had to little insights in the integrated parallel processes oft he other partners. The indicators which were used in both of the topic list, differ in how the question was proposed. For clients it was most of the time how they experienced it, and for the partners it was more on what their thoughts were regarding particular topics or how it should be. Therefore, the structures of the interviews was based on a predetermined topic list, and this positively affected the credibility of the research (Gelissen, 2010). To make sure that the respondents remain anonymous, the researcher attached numbers to their audio-fragment and transcripts.

4.4 Data analysis

To reduce the data, the interviews, which were to be recorded on tape, were to be literally typed verbatim in a transcript. Due to the fact that this transcription implied a change of medium, the interpretations based on the transcript will be verified against the tape recordings to avoid possible errors (Gibbs, 2007). To reduce the data retrieved from the transcripts, the researcher coded the data so he can draw conclusions from meaningful data (Hsieh & Shannon, 2005). This study will combine two different approaches towards content analysis (coding) as described by Hsieh and Shannon (2005). The researcher started with direct content analysis

where the coding starting point was based on theory. Second, the scholar made use of conventional content analysis where observations are used and the codes were derived from the data in an emergent manner. Qualitative data analysis software in the form of ATLAS.ti 8 was used when analyzing the data. According to (Gibbs, 2007) this software provides a structured and powerful manner to deal with large amounts of notes, text and/ or codes. As already mentioned in the data collection section, the author made sure that respondents remain anonym, and no results can be traced back to an individual.

5 Results

In this chapter the findings will be presented. First the general findings, which were experienced by all the network-members/ participant groups (businesses, knowledge instiutions, people living with dementia and healthcare professionals). Furthermore, the participant specific findings will be elaborated, and at the end the findings regarding the social innovation process and user-centered design implementation.

5.1 General findings

User focus and user involvement
According to the interviewees it is extremely important to actively involve people with dementia in the development process of the serious game. Due to the fact that no behavior of people with dementia can be estimated in advance, we do not know exactly how they would behave, therefore it is important to see how they react and behave in reality. So, it is of upmost importance that the serious game is continuously updated and improved with the help of the end-users.

Motivational aspect
The interviewees state that the motivational aspect is another important result of working in a user-centered manner. End-users gain insights in their possibilities, and see that they are capable of more than they initially thought, so, they flourish and refine purpose in life. The motivational aspect of the design holds also for the other project-members. As a result of the continuously interaction between end-users and the other project-members the problem of network tiredness is tackled, as they constantly want to live up to the expectations of the end-users and deliver the best quality they can.

Comprehend the product
Respondents argue that first you need to develop a framework and after that you can start improve the product with end-users. Interviewees show that it is necessary to build a framework before including end-users in the development process, as people with dementia find it more easily to understand and comprehend when a product is tangible and visualized.

Early information gathering and continuous iterations
When early and continuously testing and improving the serious game, you make sure that changes can be incorporated on time, whereas otherwise, you would encounter them later on in the project and you will encounter a major relapse in the serious game development. In Playtime they have chosen to quickly build a product and to almost immediately test it with the end users, when doing this they indicate that a lot of feedback was collected in the beginning, followed by more short runs or small iterations as a result of the immediately testing and optimizing.

Testing and evaluating at home

When testing and evaluating at home, you can immediately spot if the product is appropriate for the target population, in their normal environment. Another major advantage of testing and evaluating at home is the fact that people with dementia feel safe and comfortable at home. They also are less distracted by their surroundings, as in testing and evaluating in a group comes along with distractions.

Areas of expertise

According to the respondents, the project-members function as an effective multidisciplinary design network as the partners all cover a different area of expertise. The interviewees notice that there is a good balance between the research areas; the business and marketing area; the healthcare professionals who have experience with the target population and the people with dementia who experience it for themselves.

Required knowledge regarding the target group

During the development of this social innovation, the participants do not just open a glance of people with dementia, what often is done. The clinical partners as GGZ and SVD possess sufficient knowledge and expertise to effectively work with the target group.

Integrated design

When user input is obtained and begin processed, each partner does take the user into account, but participants differ in what they find more important to improve over something else.

Time and budget consuming

Interviewees mention that working according to a user-centered design consumes a lot of time and therefore money. These budget and time restrictions result in less feedback processing and implementing, as not all the feedback by the participants can be resolved.

5.2 Participant group findings

People living with dementia

The people with dementia position themselves centrally and approach the game development by means of how it could benefit them or affects them. They are the one who are ill, so what effect does it has on their life. The value created by means of a user-centered design for the end-users is mostly self-development. They engage in social, physical and cognitive activities and stimulate themselves, this results in better feedback and therefore a better product, as the more detailed feedback results in a more usable and appropriate serious game.

Businesses

The businesses focus mainly on how the serious game (development) will be as effective as possible and how they make sure that the network operates efficiently and effective. Therefore, they focus on the marketing and commercial perspective of the end product. The added value for businesses is mainly that involving end-users will result in a better selling serious game, as the gulf between developers and end-users can be breached. With their constant focus on effectivity and efficiency to secure the feasibility and appropriateness of the serious game.

Healthcare professionals

The healthcare professionals target the human and healthcare perspective, they mainly focus on how the product will benefit the end-users and try to obtain that the end-users are the most important during the development. They make sure that the end-users are not being overloaded with tasks. Value is created as healthcare professionals continuously improve their knowledge. They enable the value creation for the end-users as they guard the cognitive ballast of people with dementia. Healthcare professional secure that the involvement of people with dementia is appropriate and this results in better qualitative feedback to optimize (increase usability, feasibility, appropriateness and acceptability) the product.

Knowledge institutions

Finally, the knowledge institutions' focal point of attention is the scientific part. They make choices and perceives phenomena based on their expertise as literature/ science experts. They make sure all perspectives are considered before making a choice. They constantly try to obtain the best reliable/ validated outcomes during the serious game development. Added value for this participant group is created by means of relevant data. Are end-users involved in an appropriate way, did our approach benefit the product, will this type of development results in better product acceptance and so on (the scientifically part). They enable the network to make conscious design decisions which result in more appropriate feedback processing, feasible optimization, more usable design solutions and a better product acceptance.

5.3 Social innovation and user-centered design

The interviewees indicated that the design is implemented throughout all the perceived innovation phases, and that the created value of a principle is a result of a strong design implementation throughout all the phases. The findings illustrate that no single value or principle can be ascribed to one particular social innovation phase. All the principles combined throughout the social innovation phase, result in added value for the network participants. An example to clarify it:

''Active user involvement results in a product which is more appropriate and usable, as multiple perspectives are taken into account and the perception of people with dementia becomes clearer. When this user involvement only has been done in the prompt phase, the beginning will be promising. However, you will miss the user-involvement during the proposal and prototype phase and miss a lot of relevant insights to deliver an appropriate and usable product which would be accepted.''

6 Conclusions and Outlook

With the retrieved findings from the previous chapter an appropriate answer to the research question can be given.

'' What is the perceived added value for the participants in the playtime network when using a user-centered design to develop a serious game for people living with dementia?''

The answer to the research question consist of multiple components:

Involving people with dementia in the development process holds that immediately from the start the developers can built a game which is appropriate, is usable, is feasible to make and would be accepted by the target audience. So, the perceived added value here is that the network develops a serious game which fits the needs and desires of the people living with dementia It therefore increases the usability, appropriateness, acceptability and feasibility.

Value is also created throughout the user-centered design approach by means of the motivational aspect. The serious game developers are constantly motivated to perform up to their best, because of the wishes and desires of the end-users. When people with dementia are involve in the developing process, they flourish. They experience that they are capable of more than they initially thought, they encounter social contact and the involving in a social innovation serves as activity from which they subtract purpose in life. This increases their quality of life and therefore the motivational aspect adds the dimension of effectiveness to the concept of added value. The user-centered design adds value as the involved end-users effectively stimulate their physical, cognitive and social areas. The motivational factor will lead to a more effective, usable, appropriate, acceptable and feasible product.

When developing user-centered you also make sure that a wide variety of perspectives is included in the serious game development. Therefore, you are able to make consciousness design decisions which will optimize the quality of the final product The combined areas of expertise, which complementary add value to the final product, will increase the appropriateness, usability, acceptance and feasibility of the product.

When interpreting results from documents the possibility exist that this indirect interpretations can be different compared to the real message of the findings. When working user-centered you receive direct feedback. Correct interpretations then increases the appropriateness, acceptance, usability and feasibility of the product. It is clear to the network partners how to design a product for people living with dementia.

When developing in this manner, no major relapse will be encountered as the evolutionary continuous feedback result in incremental iterations. With each iteration the quality of the final product increases, and you make sure that you only develop relevant components of the game. The combination between the theory/ practicality of developers and people with dementia will benefit the product. In this manner the gulf between developers and end-users can be

breached, as the ideas of both parties will be combined. The developers watch the feasibility and the end-users guard the appropriateness, acceptance and usability.

Another major value contributor of the user-centered design is the at home testing and evaluating. When testing and evaluating at home, you make sure that respondents feel safe and comfortable, they will not get distracted easily, and this must result in better feedback. It will deliver useful insights, which are less likely to occur in a lab-environment. This also will increase the appropriateness, usability and eventually the acceptance of the product as unexpected phenomena will be discovered.

Until so far no cure for dementia has been developed. By developing user-centered, therefore with close contact with the people of dementia, continuous learning emerges. As dementia is still a problem without a clear solution, it is necessary to continuous improve our understanding regarding the matter, and everything we learn can be incorporated and used in upcoming projects.

However, working according to a user-centered design approach also contains some negative attributes, which do not create any value for the network participants. The design consumes a lot of time and therefore it is also expensive. Due to the continuous interaction with end-users, decision are made very slowly and this affect the duration and costs of the project. Also, when network participants work separately on their components, the possibility exist that they follow different accent paths. This can result in a serious game which is difficult to integrate and has a negative influence on the quality of the game. Due to the multidisciplinarity the problem of no mutually understanding could emerge. As healthcare professionals have no clue what the work practices of a technical game developer comprehend. The problem here is that individuals have experience difficulties on monitoring each other, as they lack the knowledge on how to do it. Finally, network participants must communicate very well, otherwise this design could have a negative impact on both the incumbents and the product. When participants poorly communicate, interpretations of findings could lack, which result in poor design solutions. On the other side, when end-users see that their feedback is not incorporated, with no clarification attached, they perceive their input as unnecessary and lose their motivation.

7 Glossary

Table 2. *Glossary.*

Concept	Definition
Added value	When referred to added value, the researcher refers to value that is added in a non-quantifiable way. Where value can be translated as a consumer benefit, where value is subjective and defined by customers', based on their perceptions of the products' usefulness (Asworth & Hogg, 2014; Kinnear & Bernhardts, 1986; Bowman & Ambrosini, 2000). Added value here is made up of appropriateness, acceptance, feasibility and usability (Bongers et al., 2018).
Playtime-network	The network consists of the following partners/ groups. Universities (JOANNEUM RESEARCH, Tranzo, GEU), healthcare professionals and their clients (GGzE, Sozialverein Deutschlandsberg) and several businesses (Famel, MindBytes, McRoberts). The network type that characterizes Playtime is that of a chain collaboration, as a result of the added value which is contributed by its incumbents can be perceived as complementary resources. A chain collaboration as stated by Goedee and Entken (2013) proposes that there is an agreement between the various (network) partners to jointly deliver a product and/ or service.
Social innovation process	The six phases are as follows, the prompt phase where the need for change is explored; proposal phase were initial plans are developed; the prototype phase where pilots inform the innovators through trial and error points; the sustaining phase, where the innovation becomes everyday practice; the scaling phase where the innovation will be spread and this ultimately leads to systematic change (Murray et al., 2010).
User-centered design	User-centered design is an iterative process, where the goal is the development of usable products, services or systems, achieved through involvement of potential users of a product, service or system in system design (Karat, 1996). With the term 'users' the people who will use the final artefact, product or service to accomplish a task or goal will be addressed (Abras et al., 2004).
Living lab	The user-centered design here indicates a Living Lab approach, this can be seen as physical regions or virtual realities where multiple stakeholders from public-private-people partnerships of public agencies, firms, users, universities and institutes, are all collaborating for creating, prototyping, validating and testing new technologies, products, services and systems in real-life contexts (Bergvall-Kåreborn, Hoist & Stahlbrost, 2009)
Serious game	Where a serious game is the reality simulated through the interaction of role players using formal and non-formal symbols, computerized sub-models where

	necessary. The technique allows participants to engage in collective action in a safe environment where they can create, experience and analyze the futures they want to explore. It enables the participants to test initiatives in a realistic environment (Jansen, 2017).

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9 User-centered design of Playtime