D1.1.1
User Requirements and Interaction Design

Work package	**WP1 User Centered Design for Social Innovation**
Task	**T1.1 User Requirements and Interaction Frames.**
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Project PLAYTIME

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Contents

1 Introduction

In one of the first steps of the PLAYTIME project, primary end users and secondary end users have been queried to determine the user requirements of PLAYTIME. In this document, the user requirements are presented in the form of two use cases, which both focus on one of the primary goals of PLAYTIME, namely: to perform a pilot of PLAYTIME together with people living with dementia. In doing so, some commonly encountered definitions in the requirement domain are presented in section 3.1, followed by an overview of each of the two use cases in section 3.2. Important to note is that this document can be best considered as a 'working document', since it provides input for the future and final document 'Software Requirement Specifications' (a deliverable of Work Package 1, task 2 'Use case specifications').

2 User requirements

2.1 User requirements defined

There is no universal definition of what a requirement is. To facilitate communication, we need to have a consistent set of adjectives to modify the overloaded term requirement. Therefore, this section presents first some definitions that are commonly encountered in the requirement domain, followed by the framework of Wiegers (2003) that will serve as a common basis.

2.1.1 Definition

Wiegers (2003) considers a requirement as a property that a product must have to provide value to a stakeholder. He uses the following definition that encompasses both the stakeholders' view of the requirements and the developer's view: "*Requirements are… a specification of what should be implemented. They are descriptions of how the system should behave, or of a system property or attribute. They may be a constraint on the development process of the system.*" (Sommerville & Sawyer, 1997).

2.1.2 Types and levels of requirements

Requirements include three distinct levels: *business requirements, user requirements and functional requirements*. In addition, every system has an assortment of non-functional requirements. The model in Figure 1 illustrates the way how these diverse types of requirements are decided to be organized in PLAYTIME. The ovals represent types of requirements information and the rectangles indicate containers (documents, diagrams, or databases) in which to store that information.

Business requirements represent high-level objectives of the organization or customer who request the system. Business requirements describe why the organizations is implementing the system, or in other words: the objectives the organization hopes to achieve. They are recorded in a vision and scope document. The second level addresses the *user requirements*, which describe user goals or the tasks that users must be able to perform using the new product. A valuable ways to represent user requirements is in the form of use cases, which are stories or scenarios of typical interactions between the user and the system. In this document, the focus will be on user requirement for PLAYTIME, which are captured in use cases (as depicted in Figure 1). However, the use cases alone often don not provide enough detail for developers to know what to build. Therefore, specific *functional requirements* - the third requirements level - should be derived from the use cases. Functional requirements specify the software functionality that the developers must build into the product to enable users to accomplish their tasks, thereby satisfying the business requirements. *System requirements*, on the other hand, describe top-level requirements for hardware and/or software system(s) and serve as input for the functional requirements.

Functional requirements are documented in a *software requirements specification* (SRS), which describes as fully as necessary the expected behavior of the software system. In addition to the functional requirements, the SRS contains non-functional requirements. These include performance goals and descriptions of quality attributes. Quality attributes augment the description of the product's functionality be describing the product's characteristics in various dimensions that are important to either users or to developers. These characteristics include: usability, portability, integrity, efficiency, and robustness. Other non-functional requirements describe *external interfaces* between the system and the outside world, and design and implementation constraints. *Constraints* impose restrictions on the choices available to the developer for design and construction of the product.

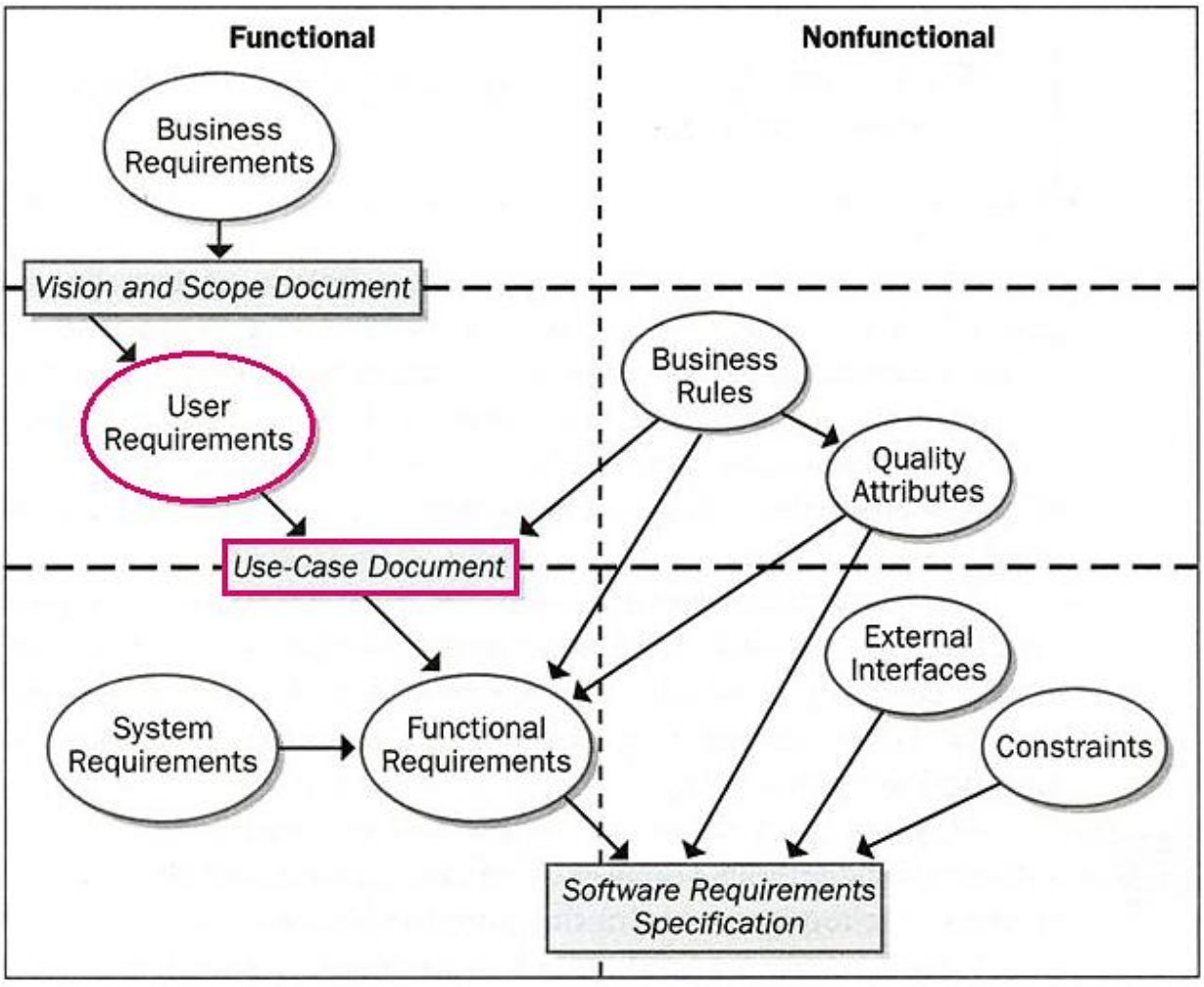

Figure 1. Relationship of several types of requirements information (Wiegers, 2003).

2.2 User requirements for PLAYTIME

After providing a common basis by using Wiegers' (2003) model, the user requirements in the form of use cases can be presented. Although there are no standard templates for the documentation of use cases, there is a considerable agreement on essential elements. These are:

- A unique use case name
- A short textual description (summary)
- A list of precondition that must be satisfied before the use case can begin
- Postconditons that describe the system after the use case is successfully completed
- A numbered list of steps that shows the main chain of events and leads from the preconditions to the postconditions

These essential elements will serve as the building block for the use cases of PLAYTIME. Two use cases are particularly relevant for PLAYTIME: (1) PLAYTIME for single clients in a home setting and (2) PLAYTIME for multiple clients in a (semi) intramural setting. Below, these use cases are explored more elaborately.

2.2.1 Use case 1

Field	Description
Use case name	PLAYTIME for single clients in a home setting
Version	1
Goal	The goal of this use case is to perform a pilot of PLAYTIME, a personalized emotion-oriented multi-model serious game that stimulates cognitive processes, addresses physical activities and fosters social inclusion, together with people living with dementia.
Summary	A formal care giver performs a need assessment in order to personalize the PLAYTIME module(s) to people with dementia. When the informal care giver has prepared PLAYTIME successfully, the module(s) can be played by the people with dementia. During the course of the pilot, the formal care giver monitors and evaluates (the use of) PLAYTIME. Data is stored in Bouncingbytes' database.
Actors	People with dementia, informal care givers (e.g. family member, friend or neighbor), formal caregiver.
Relations	Other use cases of PLAYTIME are: multiple clients, (semi) intramural settings.

Preconditions	1. People living with dementia (people with dementia and/or their informal caregiver) need to download the PLAYTIME application on a Tablet or Tablet PC. Subsequently, a user name and password need to be created. Both steps require internet access. During the course of the game, internet access is not required anymore. 2. 2. During the use of PLAYTIME, an (in)formal care giver needs to support the person with dementia at any time. 3. 3. People living with dementia and formal caregiver have to be trained in operating and creating different methods (i.e. tasks like multiple choice, puzzles, spot-the-difference, memory) of PLAYTIME. 4. 4. PLAYTIME users need to be able to understand the different methods. Therefore, a MMSE score of at least 22 is required. 5. 5. The Tablet or Tablet PC needs to be sufficiently charged.
Triggers	1. Formal caregiver introduces PLAYTIME in a home setting. 2. Informal caregiver could, if necessary, initiate PLAYTIME in a home setting. 3. People with dementia decide, based on their own interests, needs, wishes, and personal goals, when and how often they play PLAYTIME.
Basic flow	1. The formal care giver performs a need assessment. This allows her/him, as well as the informal care giver, to adapt to the difficultly level (A, B, or C) and module acceptance of the person with dementia. 2. The informal care giver logs in on a sufficiently charged Tablet or Tablet PC. 3. When logged in, the informal care giver performs the following actions: a. The individual training type is selected. b. Existing and available modules are selected or new modules are created by building a string of desired methods, or by generating own methods and design a module. 4. After a successful preparation, PLAYTIME can be played by the person with dementia. 5. Data obtained with integrated eye-tracking, movement sensors and biosignal-sensors is stored in a database on Bouncingbytes' server. 6. The eye tracking, movement and biosignal sensor data are analysed at the Bouncingbytes' server site to provide meaningful features about the mental state and level of engagement of the PLAYTIME user during training and play as well as emotional state before, during and after performing the app. 7. During the course of the pilot, the formal care giver monitors the use of PLAYTIME by analyzing the obtained data.

	8. The formal care giver evaluates eventually (the use of) PLAYTIME by interviews and/or questionnaires with users
Alternative flow	In case the person with dementia wants to extent his/her social network, he/she can play the multi-player set-up with interactive playground in an (semi) intramural setting. The interactive playground could also be introduced in the home setting if the person with dementia prefers to play PLAYTIME together with his/her informal care giver.
Exception flow	1. When there is no access to internet, it will not be possible to download the PLAYTIME app. 2. If the user enters a wrong username and/or password on PLAYTIME, no access will be provided.
Post conditions	1. At least 25 persons with dementia have played PLAYTIME. 2. The prototype(s) of PLAYTIME have been developed into a marketable product. 3. The processed features about PLAYTIME user's data obtained with integrated eye-tracking, movement sensors and biosignal-sensors remains on a Tablet or Tablet PC and is stored in Bouncingbytes' database.
Business rules	The pilot of PLAYTIME must comply with the 'Manual Ethics and Privacy issues'; The formal care giver must have finished the PLAYTIME training in order to be able to use the different PLAYTIME methods adequately.

2.2.2 Use case 2

Field	**Description**
	PLAYTIME for multiple clients in a (semi) intramural settings (e.g. day care centre)
Version	1
Goal	The goal of this use case is to perform a pilot of PLAYTIME, a personalized emotion-oriented multi-model serious game that stimulates cognitive processes, addresses physical activities and fosters social inclusion, together with people living with dementia.
Summary	A formal care giver performs a need assessment in order to personalize the PLAYTIME module(s) to people with dementia. When the formal care giver has prepared PLAYTIME successfully, the module(s) can be played. During the course of the pilot, the formal care giver monitors and evaluates (the use of) PLAYTIME. Data is stored in Bouncingbytes' database.

Actors	People with dementia, informal care givers (e.g. family member, friend or neighbor), formal caregiver.
Relations	Other use cases of PLAYTIME are: single clients, home settings.
Preconditions	1. People living with dementia (people with dementia and/or their informal caregiver) need to download the PLAYTIME application on a Tablet or Tablet PC. Subsequently, a user name and password need to be created. Both steps require internet access. During the course of the game, internet access is not required anymore. 2. 2. During the use of PLAYTIME, a formal caregiver needs to support the persons with dementia at any time. 3. 3. People living with dementia and formal caregiver have to be trained in operating and creating the different methods (i.e. knowledge-based questions, movement exercises) of PLAYTIME. Next to this, training ensures that the formal care giver is able to lead the game adequately. 4. 4. PLAYTIME users need to be able to understand the different methods. Therefore, a MMSE score of at least 22 is required. 5. 5. The number of people allowed to play PLAYTIME is minimal two and maximal ten (five teams of two players). 6. 6. Both the Tablet or Tablet PC and the cones needs to be sufficiently charged.
Triggers	1. Formal caregiver introduces PLAYTIME in (semi) intramural setting. 2. People with dementia decide, based on their own interests, needs, wishes, and personal goals, if they want play PLAYTIME.
Basic flow	1. The formal care giver performs a need assessment. This allows her/him to adapt to the difficultly level (A, B, or C) and module acceptance of the person with dementia. 2. The formal care giver logs in on a sufficiently charged Tablet or Tablet PC. 3. When logged in, the informal care performs the following actions: a. The group training type is selected. b. Existing and available modules are selected or new modules are created by building a string of desired methods, or by generating own methods and design a module. 4. The formal care giver lays out the interactive playground, unpacks and sets up the cones 5. After a successful preparation, PLAYTIME can be played by people

	with dementia. 6. Data obtained during the play of PLAYTIME stored in a database on Bouncingbytes' server. 7. During the course of the pilot, the formal care giver monitors the use of PLAYTIME by analyzing the obtained data. 8. The formal care giver evaluates eventually (the use of) PLAYTIME by interviews and/or questionnaires with users.
Alternative flow	In case the persons with dementia want to play and practice the modules of PLAYTIME more frequently, they can play the individual player set-up at home.
Exception flow	1. When there is no access to internet, it will not be possible to download the PLAYTIME app. 2. If the user enters a wrong username and/or password on PLAYTIME, no access will be provided.
Post conditions	1. At least 25 persons with dementia have played PLAYTIME. 2. The prototype(s) of PLAYTIME have been developed into a marketable product. 3. The data obtained during the play of PLAYTIME is formatted from the Tablet or Tablet PC and stored in Bouncingbytes' database.
Business rules	The pilot of PLAYTIME must comply with the 'Manual Ethics and Privacy issues'; The formal care giver must have finished the PLAYTIME training in order to be able to use the different PLAYTIME methods and lead the game adequately.

3 Conclusions and Outlook

In this document, the user requirements for PLAYTIME have been presented in the form of two uses cases: (1) PLAYTIME for single clients in a home setting and (2) PLAYTIME for multiple clients in a (semi) intramural setting. As a next step, the Software Requirements Specification need to be considered in order to provide the serious game developers with enough detail to know what to build. In considering these specifications (see Work Package 1, task 2 'Use case specifications'), the user requirements presented in this document will serve as an important input, as showed in the framework below.

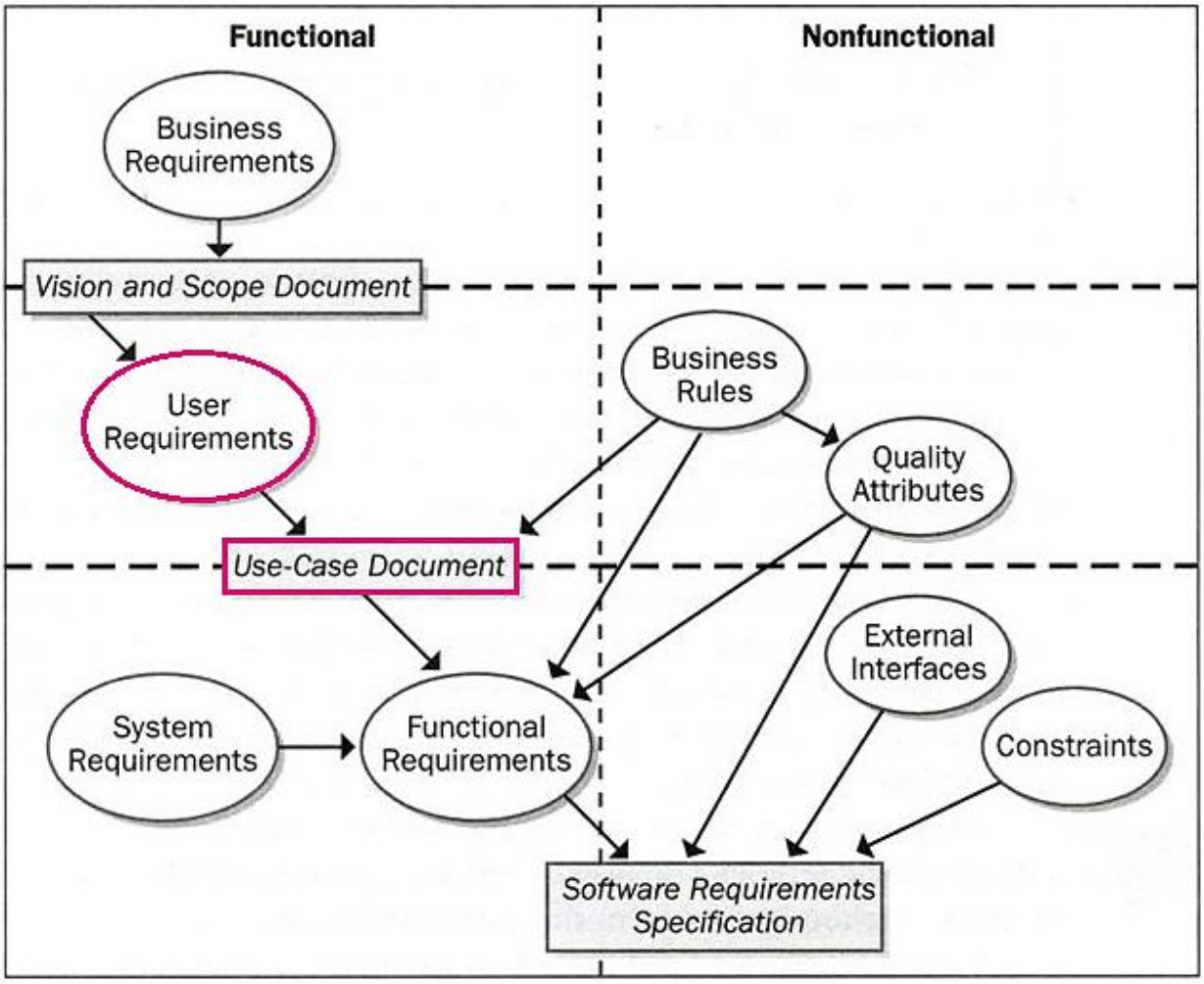

Figure 2. Relationship of several types of requirements information (Wiegers, 2003).

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