

Leaves

optimizing the mental health and resilience of older Adults that
have lost their spouse via blended, online therapy

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Abstract

LEAVES is an online service that supports older adults who have lost their spouse in dealing with prolonged grief. The development of the LEAVES online service is organized in three iterative cycles, each one resulting in a version of the technology. This report describes the results of the end-user tests of the three prototypes developed in the M6, M12, and M18. Tests were conducted in the Netherlands, Switzerland and Portugal. This report gives an overview of the feedback received among the three testing sites for each prototype. In detail, it includes some background literature, a discussion of the results, and recommendations for the technical development for the following prototype. Finally, this report includes some recommendations for the exploitation of LEAVES as a product in all three countries.

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Symbols, abbreviations and acronyms

AAL	Active Assisted Living
D	Deliverable
DELA	DELA Natura- en levensverzekering N.V.
EC	European Commission
M	Month
NFE	National Foundation for the Elderly
NTH	Nothing AG
RRD	Roessingh Research and Development
SFT	Sensing Future Technologies
SSW	School of Social Work, University of Applied Sciences and Arts, Olten
T	Task
ULSBA	Psychiatric Department at the Health Unit of Baixo Alentejo
UNL	NOVA University of Lisbon
UoB	University of Bern
WP	Work Package
MVP	Minimal Valuable Product
P	Participant
ECA	Embodied Conversational Agent
ASQ	After Scenario Questionnaire
HUBBI	eHealth Usability Benchmarking instrument
SUS	System Usability Scale

1 Introduction

LEAVES is a novel online service designed to aid older adults dealing with (prolonged) grief symptoms after losing their spouse. The development of LEAVES is intended to take at least 24 months. These two years are divided into three iterative design cycles with end-user tests at the end of each six-months period (Figure 1). Finally, after the third round of usability test, the clinical trial will take place in M24. Iterative design was chosen as a method because it allows to “shape the product” through a process of design, test, redesign, and retest activities” (Rubin & Chisnell, 2008, p. 14) according to target groups’ needs.

This report describes and discusses the results of the end-user tests of these iterative cycles. The results of the end-user tests will be used to assess the receptivity of the MVPs. Moreover, the insights of the rounds of end-user tests will also be used to improve the prototype in further development.

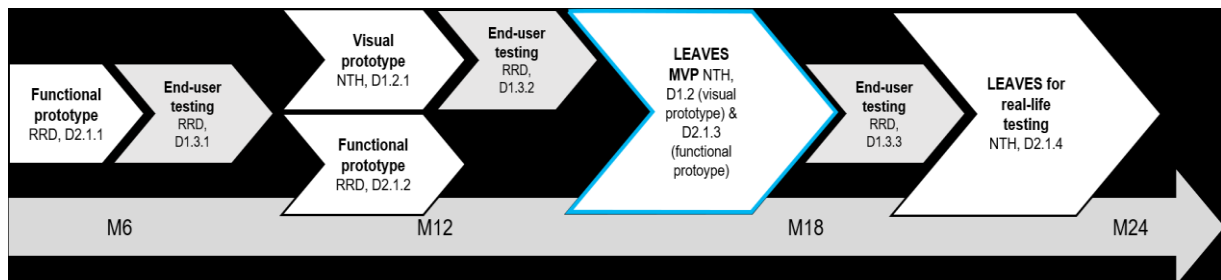


Figure 1: Iterative design cycles

This report also includes an introduction to the literature on conversational agents in eHealth, a discussion of the results of the end-user tests and recommendations for the design of the following prototype.

2 Background and Literature

In modern times, the aging society causes new challenges for the healthcare sector. The aging population goes along with issues such as staff shortages and limited resources in healthcare facilities (Jayaprakash, O'Sullivan, Bey, Ahmed, & Lotfipour, 2009). While some health issues can only be treated by clinical experts, other health issues may be resolved by the affected person themselves. To support people in solving health issues independently, eHealth applications can prove useful. They may reduce barriers to accessing necessary mental health services, such as cost, distance, wait-times, and the stigma surrounding receiving treatment or support for mental health issues (Price et al., 2014). For instance, eHealth applications are appropriate for accessing relevant health information or the adoption of healthy behaviors (Kreps & Neuhauser, 2010). However, eHealth applications often struggle to keep users engaged over a long-term period. This lack of engagement is also rooted in the lack of interactive features in eHealth applications (Hashim, 2016). Many health applications provide advice in the form of plain text or text-based question-answer modules (Kaptein, De Ruyter, Markopoulos, & Aarts, 2012).

To keep the user engaged with the service, conversational agents gained increasing popularity in the eHealth domain. Their purpose is to stimulate user engagement and increase the use of eHealth applications (ter Stal, Kramer, Tabak, op den Akker, & Hermens, 2020). Denecke, Tschanz, Dorner, and May (2019) emphasize that conversational agents could play a leading role by embodying the function of a virtual assistant and bridging the gap between patients and clinicians. Furthermore, conversations can be tailored to the particular needs of a patient and to his health literacy. In the past, conversational agents were already used to support users in self-guided interventions. For example, conversational agent motivated users into engaging in more physical activity, increased their mental well-being, promoted fruit and vegetable intake or supported couple therapy (Bickmore, Schulman, & Sidner, 2013; Motalebi & Abdullah, 2018; Watson, Bickmore, Cange, Kulshreshtha, & Kvedar, 2012).

In the context of the LEAVES project, the conversational agent is supposed to assist elderly dealing with grief symptoms. This can provide a suitable way of interacting with technology for elderly, who are often with technical impairments and can only use simple icons to interact with their technical environment. Fadhil (2018) argues that systems with a conversational agent have a low learning curve, but still can integrate multiple functions at once. Hence, conversational agents seem to be a fitting tool for a target group equipped with less technical skills.

Conversational agents have already been integrated into web-based interventions for seniors. In Cereghetti et al. (2015) conversational agents were virtual support partners that attended the daily activities of seniors. The aim of the study was to find out about the preferred role and about the preferred personality of the conversational agent. Results show that most of the seniors preferred the conversational agent as a friend or as a family member with a friendly and empathic attitude. Nevertheless, a part of the seniors preferred the conversational agent in the role of a personal assistant instead. ter Stal, Tabak, op den Akker, Beinema, and Hermens (2020) tested the preferences of elderly users regarding the conversational agent's age, gender, and role. Results showed that elder participants also preferred conversational agents with an older appearance compared to a younger target group. Furthermore, the study showed that female agents are generally preferable over male agents. Consequently, the conversational agent Luisa of the service LEAVES is based on – LIVIA - could enhance the experience of elderly people with LEAVES. However, creating the right conversational agent for elderly is a challenge (Montenegro, da Costa, & da Rosa Righi, 2019) and it can also depend on the eHealth technology in which the agent is integrated. Hence, designers should investigate the preferences in the design of conversational agents with respect to the specific target group the eHealth intervention is aimed at and develop the service and the conversational agent accordingly.

3 Objectives

The aim of this report is to report and align the results of the end-user testing of the M6, M12, and M18 prototypes.

Firstly, the purpose of the first round of end-user testing (M6) can be described as following:

- Assess the reactions of end-users towards functionalities and technological components of LEAVES
- Capture the reaction of the end-users towards the embodied conversational agent (ECA)
- Capture the reaction of end-users towards the dialogue format of the LIVIA modules
- Test the first personalization elements that were included in the M6 prototype
- Generate design recommendations for the M12 prototype

Secondly, the M12 prototype is a set of screenshots, depicting the main functionalities of LEAVES as well as the interaction paradigm that will be used during the onboarding phase and during the therapy phase. Additionally, the M12 prototype has a page with privacy statements. Accordingly, the objectives of the second interaction are:

- To gauge participants' understanding of the onboarding process.
- To gauge participants' understanding and appreciation of the main LEAVES functionalities.
- To gauge participants' understanding of the conceptual LEAVES interface and interaction design.
- To gauge participants' understanding of how their privacy is respected in LEAVES.
- To gauge participants' understanding of the value of LEAVES as a product.

The M18 prototype is the MVP of the LEAVES service in the month 18th of the project. This contains all functionalities, a full onboarding process, and one fully elaborated study module ('Fostering Positive Thoughts and Emotions'). The goals of this third interaction are:

- To discover usability issues in the current MVP, precisely:
 - Usability and user experience of the onboarding process;
 - With the general navigation through the prototype;
 - In the interaction with the virtual agent 'Sun'
 - Usability and user experience whilst working through the study module.
- To understand the perception of the virtual agent 'Sun' in the prototype;
- To understand participants' opinions regarding the value of LEAVES as a product.

3.1 Relation to other deliverables

This deliverable of WP1 highlights users' needs, requirements, and opinions regarding LEAVES in three different prototype phases. This has an impact on the way LEAVES is being developed in terms of design, content, and functions. Because of this, this deliverable is directly related to WP1.2 and WP2 regarding the visual design and technical development of LEAVES.

Additionally, during the usability testing, some questions regarding the willingness to use and pay LEAVES are present. The answers to these questions are linked to the creation of a business model (WP4) for the exploitation of the LEAVES service in the Netherlands, Portugal, and Switzerland.

Finally, after the third usability testing, the clinical trial will take place. This means that the insights gathered during this last testing will influence the way the LEAVES application will work during the period of six months of the clinical trial. Therefore it is also indirectly linked to WP3. In Figure 1 above, the exact relation with the some of the deliverables of LEAVES is also shown.

4 Iteration 1: M6 Prototype

4.1 Objectives

To assess the receptivity of the LEAVES online service by end-users in the Netherlands, Portugal and Switzerland, end-user tests were arranged in the three countries. The goal was to investigate the acceptance of the overall concept of LEAVES. The tests were performed on the M6 prototype, equipped with an initial selection of functionalities.

4.2 Method of Analysis

This document aims to give a brief overview of the results of the end user tests among the different testing sites. Prior to the testing, an end user testing protocol was written and directed to the organizations responsible for the execution of the end user testing (Appendix A). A fixed procedure was described in the protocol. The purpose of the protocol was to elicit comparable, qualitative responses from the participants through thinking aloud techniques, natural observations, and interview questions. The protocol also involved a scenario that participants were supposed to use in case they have not lost their real spouse (Appendix B). Organizations responsible for the testing performed the tests according to the end user testing protocol and wrote a summary for each participant. The summaries from the Netherlands and Portugal were translated into English, the summaries from Switzerland were written in German. Responses of the participants were anonymized.

The various summaries were analyzed, and the content was grouped into categories. Categories were formed based on re-emerging topics that were mentioned by users repeatedly. As test users were interviewed according to the user testing protocol, the categories strongly relate to the interview questions of the protocol. Within the categories, the content is structured into sub-headings with more detailed elaborations of the user feedback. At this point, it should be acknowledged that the reported results have been subject to interpretation at two stages of the analysis process: First, when the on-site researcher compiled a summary of the local results and second, during the current analysis that combines the results from all three countries.

4.2.1 Demographics

In total, 13 participants tested the M6 prototype among the different testing sites. Participants were aged between 60 and 84 ($M = 71$). Five of the participants were from the Netherlands (Two from DELA, three from the NFE). Another five participants came from Switzerland. Three participants came from Portugal. Nine of the participants were female and four were male. Tests have either been performed on a laptop or a tablet. Not all participants lost their spouse, but all participants experienced some type of major loss in their life, whether it be a close relative, a spouse, or a pet that was important to the owner.

Table 1. Overview of the participants

Participant	Nationality	Age	Gender	Lost Spouse	Testing device
P1	Swiss	76	m	No	Laptop
P2	Swiss	67	f	No	Laptop
P3	Swiss	60	f	Not clear	Laptop
P4	Swiss	65	f	Not clear	Laptop
P5	Swiss	67	m	No	Laptop

P6	Dutch	69	f	No	Laptop
P7	Dutch	78	f	No	Laptop
P8	Dutch	69	f	Yes	Tablet
P9	Dutch	78	f	Yes	Tablet
P10	Dutch	84	f	Yes	Tablet
P11	Portuguese	66	m	No	Laptop
P12	Portuguese	71	m	No	Laptop
P13	Portuguese	74	f	No	Laptop

4.3 Results

4.3.1 General Impression of the User Evaluations

The general attitude of the users towards the service was positive. Although almost all participants expressed some form of critique about the service or the state of the current prototype, participants also realized that this intervention holds great potential. The general purpose of the service was understood by all participants. The participants conceptualized LEAVES as a modern support system for elderly who lost their spouse. Some users understood that coping and self-reflection skills are exercised through the service (P2; P4). Most of the users seem to be willing to accept help from the LEAVES service themselves, if needed.

A perceived advantage that was mentioned frequently by the users is the flexibility of the service. Users highlighted that they appreciate to be able to use the intervention whenever and wherever they want. Also, the users appreciated that the LEAVES service can be used independently. In general, users felt comfortable in the individual one-to-one setting and felt comfortable with sharing information. Users understand that they are not obliged to use the service at all or disclose any type of information if they do not want to.

Many participants indicated that the prototype feels unfamiliar at first. After using the service for a bit, most participants got used to the way the system operates and were able to use it without encountering major difficulties. Users expressed concerns that it may become difficult to persuade seniors into engaging with the LEAVES service in the first place due to its unfamiliarity. Regardless, most of the users understood how to operate the system without encountering major difficulties.

4.4 Usability of the M6 prototype

The usability of a product is typically examined by looking at the effectiveness, efficiency, and user satisfaction (ANSI, 2001). As effectiveness and efficiency are usually assessed in numeric measurements (number of errors, time needed to perform task X etc.), these elements of usability can hardly be assessed from written summaries. Instead, this analysis focuses on *indicators for perceived usability* in the written summaries.

4.4.1 Intuitiveness/ease of use

Most testers felt comfortable and intuitively knew how to operate the system. They seemed “*curious, interested, and intuitively knew what to do and clicked through the program*” (P1; P2; P3; P4; P6; P7; P9; P12). After they got accustomed to the interface, most of them did not encounter any major usability

issues. For instance, testers labelled the presentation as “*clear*”, “*easy to use*” and “*easy to read*” (P1; P2; P3; P7).” Most of the users were familiar with using a keyboard, but the speed in which they entered for instance their name differed from user to user. Most of the users seemed to type rather slowly in terms of speed. Some of them seemed familiar with using a laptop or tablet to type information, other user made the impression that typing is a little more challenging for them. One of the users asked the experimenter to type for him (P12). One of the participants who tested the demo on a tablet got annoyed by typing on a tablet and indicated that she would rather use a laptop, as the task involves a lot of keying (P8).

Many participants indicated that it is difficult for them to formulate and type down their feelings and thoughts in general. Some participants argued that it is more difficult for them to formulate their feelings because they take the perspective of the person in the scenario (P1; P3; P6). Another participant mentioned that it is difficult for them to write down feelings in the setting of a user test, as she did not know whether she was doing the exercise for herself or for the purpose of testing (P2).

4.4.2 Barriers

A few testers did encounter severe issues while interacting with the prototype. For instance, one participant did not understand that the buttons could be clicked (P10). Instead, this participant started to answer the question by herself, talking to the screen. Another participant also did not grasp that he needed to click the buttons in order to proceed to the next screen (P11). One participant struggled with opening the demo website and choosing the language (P5). One of the testers stated that she is not fond of the service, because “*she is not a website person*” (P7).

4.4.3 User Satisfaction

The absence of a back button seemed to irritate or even frustrate some of the users, especially if they clicked too fast by accident and felt like they missed information (P2; P5). One participant was bothered by the fact that she often had no choice but to click continue (P7). Furthermore, a few participants indicated that they did not know if they missed important information if they deliberately decided to skip something (P4). It is also not apparent if the user will have the option to go back to the skipped information later in time.

A factor that seemed to contribute to more user satisfaction is personalization of the service. For example, two users stated that they appreciate being called by their name by the conversational agent. (P1; P9). They liked that they were addressed by the name chosen at the start of the demo, and that they were able to give themselves their own nickname if wanted.

4.5 Reactions towards the conversational agent

4.5.1 Understanding Luisa as a virtual agent

Some users understood Luisa as a program while others did not. Despite of the simple and tentative design of the M6 prototype, some users believed that Luisa is a real being. A user for instance indicated that she believed that she is the representation of a real person. For others, it seemed obvious that she is an artificial agent. Some quotes from the summaries to illustrate the ambiguous beliefs of the different users:

- *(Luisa) “is a cliché computer program with a rigid facial expression” (P5)*
- *“Luisa is real, it’s from DELA! I’m guessing they have somebody there who is asking these questions. It has to be real!” (P6)*

- “She thinks Luisa is real. With a fake person you can’t have a conversation like this. Then you might as well put a robot there with pre-programmed answers.” (P7)

4.5.2 Natural interaction

Some of the users indicated that they perceived the interaction with Luisa as unnatural. One participant argued that it rather feels like a “*list of questions*” that is presented to the users (P5). Luisa has made an “*inflexible, rigid, or stiff*” impression to some of the users (P3; P5, P7). Two users indicated that the input sometimes does not match the output, since Luisa does not seem to react to the input specifically (P9; P10). Here an example why the interaction felt unnatural for one of the participants: A lady typed her story, in which she described the last years with her husband and how her social relations got worse while he was still alive, because she had to take care of him. After he died, her social relations got better again. Still, Luisa seemed to assume that social relations get worse after the spouse deceases, although the lady explicitly wrote that her social relations got better (P10).

4.5.3 User-Trust (credibility)

The participants expressed great trust towards the service. Only one out of 13 participants indicated that he had minor trust issues towards the service. She said that she “*is usually very skeptical about sharing confidential information on the internet*” (P4). The rest of the testers felt comfortable sharing confidential information. Users seemed to understand that it is necessary to disclose personal information if they want to benefit from the service (P2; P3). Others simply did not care what the system knows about them (P5). Some of the users stated to trust the system because the prototype was presented by workers of institutions that they trust.

4.5.4 Reactions towards Luísa’s background story

Some of the users reacted towards Luísa’s story by sharing their own experiences. For one of the participants, Luísa’s background story even “*triggers this lady to talk about her own process.*” (P8) Another user started “*extensively talking about how she dealt with her loss*” (P9) after being confronted with Luísa’s background story. Few of the users expressed that they would like a much more detailed background story of Luisa (P6, P8, P9). They suggested that they would like to know more about Luísa’s history with her deceased spouse Thomas. Furthermore, it was asked for more explanations how Luisa managed to deal with her grief symptoms after Thomas deceased. Also, a user was interested in Luísa’s origin, education, and job experience.

Other users indicated that they did not care about the background story of Luisa at all. Some of them expressed that they were “*solely interested in the self-help platform*” (P2, P3, P5). It seems like the participants that recognized Luisa as a computer program were less interested in her background story than the participants who believed that Luisa was real. (P3, P5) One of the testers even stated that she finds it “*presumptuous*” (P5) to fake a background story for a virtual agent. If the user understands that they are interacting with a conversational agent, they may perceive a fake background story as manipulative.

4.5.5 Reactions towards Luísa’s personality and appearance

Luisa was perceived as an “*empathic, knowledgeable*” person (P1, P2, P3, P7, P8). She made an “*objective*” impression, and most users felt comfortable in the interaction setting with Luisa. Most users appreciated that Luisa was presented as one of their peers. Some participants also indicated that it was not necessary for her to have the same background story, an empathic listener would be enough.

The appearance of Luisa was criticized more frequently than her character. Many users found that Luisa “*looks older than she describes herself in the text, boring*” (P1) and “*lifeless*” (P5). Another

user said that she “*doesn't like Luisa's appearance, her grey hair* and that she “*doesn't think she would like her in real life.* (P6)”

4.6 Reactions towards the content

4.6.1 Name confusion

Some of the participants seemed to struggle with the introduction of the names LEAVES, Luisa and LIVIA (P8; P9, P10). These participants mixed up the names, and some of them got confused about the differences in the elements. Apart from the fact that they all start with the letter L, too many new names at once combined with an unfamiliar interface may be presented to the users during the introduction.

4.6.2 The dialogue format

Some users were dissatisfied with the presentation of the content. The dialogue format caused some issues. It was labelled as “*long-winded.*” (P2, P4, P5, P7). Users expressed their needs for more “*coherence*” and “*overview.*”. They perceived the text as chopped, and some of them stated that they would have preferred a longer text to increase the readability by presenting a coherent text. For a few users, the amount of text was too much in general. For instance, one of the users “*notices that she has to read a lot*” and then “*gets annoyed that the explanation is taking too long.*” (P7). Some users would have liked to skip more of the information but did not dare to do so because of the testing environment or because they felt like they would miss valuable information. The content of the LIVIA module about social relations was perceived as positive. The participants felt like it all sounds “*familiar*”, the information was considered interesting and informative and the participants agreed with the texts

4.7 Further information about the service

Most users were interested to find out more about the service. For instance, they were interested in the design process of the LEAVES project and which experts were involved. Users indicated that they could imagine various sources from which to hear about the service. Various users mentioned that they would like to hear about LEAVES from institutions. Examples for such institutions mentioned by the users could be retirement homes, home care services, psychiatric clinics, religious institutions or municipalities. One user said that a promotion through undertakers may be too early or even obtrusive. Promotion of the service through media was also frequently mentioned. Suggestions were flyers, web search/internet promotion and newspaper advertisement.

4.8 Discussion and recommendations

While most of the participants managed to use the prototype without encountering major problems, some of the users seemed to struggle even with the simple functionalities of the current prototype. Digital literacy may be more of an issue for this intervention specifically, as older users usually have lower digital literacy than younger ones (Eshet, 2002). Persuading users with low digital literacy into using LEAVES may become especially challenging, as users need to overcome a digital barrier before they can utilize the LEAVES service (Kopp et al., 2018). However, digital literacy skills rather depend on the individual's experience with technology than on the age-related cognitive development (Eshet-Alkalai & Chajut, 2010). To assure that users with low digital literacy can get the chance to be included into the LEAVES service, two things should be considered: Firstly, adding new functionalities to the prototype will increase the need for more digital literacy, and therefore exclude more potential users from being able to use the service. Secondly, a proper onboarding with a thorough introduction of the functionalities may already resolve these issues, as none of the end-users in any of the three testing countries encountered major difficulties anymore after they learned how to use the interface.

An interesting finding was that some of the participants believed that Luisa is a real person or at least the representation of a real person. This raises the question whether Luisa’s artificial nature should be revealed to the user more openly. Highlighting that she is not a real person may affect how the user interacts with her and it may impact the user trust towards the service. One of the testers stated that *“she would rather not know if Luisa is real or fake, because she would not speak to the agent if she knew that it is a robot.”* In later design phases, the conversational agent will look more realistic and behave more human-like, eventually. Most likely, even more of the end-users will believe that Luisa is a real person. This also raises ethical questions – Does it matter if the user is informed about the artificial nature of Luisa? Why (not)?

There was an issue regarding the methodology that seemed consistent across the different testing sites. Many of the participants did not lose their spouse yet, so they were ought to use the scenario to take the perspective of a person that recently lost their loved one. Working with the scenario seemed problematic for many of the participants, as it was difficult to imagine the scenario situation for many users. Furthermore, some of the users who were introduced to the scenario were not sure whether they should answer based on the scenario or based on their own situation. This led to impression that the use of a scenario rather resulted in confusion and uncertainty. Although end-user tests conventionally include research scenarios, it could be argued that a scenario was not necessary for the M6 end use tests. As participants were seniors of advanced aged, all of them experienced an impactful loss, already. Apart from this, it can be concluded that the first round of end-user testing proceeded smoothly.

4.8.1 Design recommendations

The participants had various design recommendations for further improvements of the service. Based on the analysis of the end-user tests and the recommendations made by the participants, a list of recommendations was created (table 2).

Table 2. Design recommendations

Recommendation	Example
Facilitate natural interaction	<ul style="list-style-type: none"> • Feedback on mood states of the user • Narrative skills
Personalization of the service where possible	<ul style="list-style-type: none"> • Choosing/creating an agent • Tailor the conversation towards the user’s needs – Let them choose what they talk about
Give the user the option to skip information	<ul style="list-style-type: none"> • Information perceived as redundant for some users (like background story) should be easily skipped any time
Add a back button	<ul style="list-style-type: none"> • A small arrow to the left next to the continue button could serve as a back button so the users can go back in the dialogue if they want to
An overview of the session	<ul style="list-style-type: none"> • By giving a preview and a time frame of the session the user knows what to expect and will not perceive the dialogue as “long-winded” or “endless”
A summary after the session	<ul style="list-style-type: none"> • A brief summary after each module will help the user to remember new insights

Change Luisa's name OR introduce Livia without its name	<ul style="list-style-type: none">• Changing the name or introducing Livia without its name will result in less confusion of users about similar sounding words
Different colour design	<ul style="list-style-type: none">• Use lively colours for the user interface instead of the current pale colour design• Give Luisa more distinguishable colours, she looks a little boring
Add a goodbye screen once a module is finished	<ul style="list-style-type: none">• The conversational agent could make it more clear to the user that the session is finished for now (for instance by saying farewell).

5 Iteration 2: M12 Prototype

5.1 Objectives

The M12 prototype is a set of screenshots, depicting the main functionalities of LEAVES as well as the interaction paradigm that will be used during the onboarding phase and during the therapy phase. Additionally, the M12 prototype has a page with privacy statements. Finally, participants were asked questions regarding the value they see in LEAVES and how much they will be willing to pay. The objectives of the second interaction are, therefore:

1. To gauge participants' understanding of the onboarding process.
2. To gauge participants' understanding and appreciation of the main LEAVES functionalities.
3. To gauge participants' understanding of the conceptual LEAVES interface and interaction design.
4. To gauge participants' understanding of how their privacy is respected in LEAVES.
5. To gauge participants' understanding of the value of LEAVES as a product.

5.2 Protocol

Older adults (60+) from the Netherlands, Portugal, and Switzerland were recruited to participate in a face-to-face or online session to test the LEAVES prototype. They were required to have lost at least someone in order to participate in this study. Before starting this session, they were asked to sign an informed consent form to agree about the usage of the information provided for research purposes. Additionally, some personal information was asked, like age, gender, technology usage, and living situation. Afterwards, they were read the scenario of Monika to allow them to understand better the situation of a person grieving. During the testing, the protocol in Appendix C was used.

This study was divided in four parts. Firstly, participants had to go through the onboarding process and asked questions about it. Secondly, they had to look at a study module and express their preferences in the way it was presented. Thirdly, participants had to read the privacy statement and give their opinions about it. At the end, they were asked some questions regarding the added values of LEAVES and willingness to use and pay for a service like LEAVES. During the first three parts, participants were asked to think out loud to allow the researcher to understand their way of thinking.

After the sessions, the most important parts were transcribed and sent to one researcher which was responsible for the analysis. The usability issues were categorised according to the four parts of the study.

5.3 Results

The prototype was tested in three pilot sites (The Netherlands, Switzerland, and Portugal) with elderly people who lost a partner or someone close to them some time ago. A total of twelve people participated. In the Netherlands, three people were recruited and all interviews, except for one which was conducted in person, were conducted online. For the online sessions, the researcher asked the participants to share their screen. For one participant it did not work, thus the researcher shared the screen with the participant and asked her to say where to click on within the prototype. One Dutch interview was not finished because of a lack of time.

In Switzerland, six people participated. Five sessions were face-to-face and one was conducted online via Zoom. Three of the Swiss participants also participated in the first end-user testing.

In Portugal, three people participated and the interviews were conducted online. The researcher shared the screen with the participants and asked them to say what to click on the prototype. A summary of the demographic of all participants can be found in the table below (Table 3).

In general there were some struggles with conducting the interviews in all three countries,. Some participants could navigate quite well through the prototype. Others needed much help to understand how to navigate through the prototype and what they had to.

The following subchapters will present the results for each country according to the four sessions of the study. In the following chapter, a summary of the results will be given. In the last chapters, the general implications of the results will be presented.

Table 3. Demographic. Note that the data of one participant is missing for privacy reasons.

Participant	Nationality	Age	Gender	Living situation	Technology usage	Lost someone	Who and How long ago
P1	Dutch	69	m	Alone with a dog	Laptop, Smartphone, Tablet	Yes	A kid, Father, Two sisters, Mother. Partner, 6 years ago
P2	Dutch	76	f	Alone, but kids who come to visit often	Laptop, Smartphone, TV, Radio	Yes	Partner, 7 years ago
P3	Dutch	-	-	-	-	-	-
P4	Portuguese	60	f	Together with someone	Smartphone	Yes	Mother, 10 years ago
P5	Portuguese	62	f	Together with someone	Laptop	Yes	Father, 3 years ago
P6	Portuguese	73	f	Alone	Regular phone	Yes	Partner, 6 months ago
P7	Swiss	77	m	Together with someone	Smartphone, Laptop	Yes	Mother, 23 years ago, Father, 47 years ago, 6 siblings, 4, 6, 7, 13, 29, 33 years ago.
P8	Swiss	67	f	Together with someone	Smartphone, Laptop, Tablet	Yes	Father, 25 years ago, Mother, 11 years ago
P9	Swiss	61	m	Together with someone	Smartphone, PC	Yes	Mother, 6 years ago, Father, 2 years ago
P10	Swiss	69	f	Together with someone	Smartphone, Laptop	Yes	Father, 33 years ago, Mother, 6 years ago
P11	Swiss	61	f	Together with someone	Smartphone, Laptop, Tablet	Yes	Ex-husband, 3 years ago

P12	Swiss	63	m	Together with someone	Smartphone, Laptop, Tablet	Yes	Wife, 16 years ago
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5.3.1 The Netherlands

This chapter will present the results of the end-user testing in the Netherlands. These results are divided according to the scenarios presented in the protocol of the study. The enumeration of the participants corresponds to the order in which Dutch participants were interviewed. In the Netherlands, because of lack of time, in the last interview, the questions for half of session 2 and session 3 were skipped.

5.3.1.1 Part 1: Onboarding and main functionalities

During part 1 of the study, 'onboarding and main functionalities', most participants said that they felt that it was unclear why, so early in the process, the system asked them questions regarding their friends/ family members and their contacts. One participant said that he did not understand *"why I need to say this now"* (P1). Additionally, another participant said that, if she was the character of the scenario, she would not have wanted to be so social. Lastly, the third participant said that she would be interested in knowing where this program will lead her to. Therefore, the system should tell her how long it will take to go through the onboarding or it should ask how the user feels in order to understand if she or he is ready to answer questions regarding her or his relationships.

At the end of part 1, participants were asked four questions. Firstly, they were asked who 'Sun' is. Two participants could not recall the character, but once they did, they both gave the virtual agent a meaning of hope as 'Sun' meant 'the light at the end of the tunnel'. One participant suggested calling the virtual agent with a person's name, like Marie, and stating that it is not a real person. Secondly, the researcher asked what the purpose of the task in part 1 was. Two participants said that it was about writing down the friends of the user (s)he can count on. However, one participant said that writing down the contact persons should be a choice. Thirdly, participants were asked if they felt comfortable interacting with such a technology. One participant said that he would rather talk with an alive person who can understand his emotions. The other participants said that it could work for them, but *"it can differ per person"* (P3), and *"it will always be hard"* (P2). A participant suggested leaving users a number they can always call when they have questions. Additionally, she thinks that it would be nice to have a video tutorial with some text for example. Lastly, all participants said that they would like to work on LEAVES alone, *"because it is something private"* (P3).

5.3.1.2 Part 2: Study session

5.3.1.2.1 Scenario 2.1

In this part of the prototype, users are supposed to think about how their relationships changed after the loss of their spouse. One participant made an initial consideration saying that she would like to know where she is in the program, how many sessions she would still need to go through, and for how long. Moreover, in this part, there is too much information which she would have liked to see at the beginning, like who are the people behind LEAVES (psychologists in Switzerland) or about what the user needs to know about the program. Finally, she said that the questions require too big answers which could overwhelm the user. Therefore, questions should be divided into small questions. Another participant said she thinks that it would be hard to think about how relationships have changed over time when a person is still processing the loss of her or his spouse.

The question asked in this sub-session was related to the modality participants would want to fill in the information asked by the program (e.g., typing, writing by hand, speaking, taking pictures). Most participants said that they would like to write things by hand because it is *"only for myself"* (P1) and because *"I feel it closer to me"* (P2). Lastly, P3 suggested that it would be nice if the user is given tips on what to write, like *"write 3 positive things"*.

5.3.1.2.2 Scenario 2.2

In this scenario, participants were shown some of the tasks users can do when using LEAVES. One participant said that he would not like to write in a diary, also because he thinks that he would not have

the energy to do that just after having lost someone. However, he said that it depends on the person and some people who have fewer friends or would think to be a burden for their friends and family would use a program like LEAVES. Nonetheless, the other participants were quite positive about writing in a diary. However, it should not be *“a burden to write things down”* (P2) and there should be more structure. Accordingly, a participant suggested that there should be a list where participants can see all the tasks they may need to do. When they fulfil a task, they could decide if giving a reward to themselves. As positive aspects, participants liked that the program could inspire them with activities and that there was an explanation for them. Moreover, a person said that she would trust LEAVES.

After seeing scenario 2.2, participants had to answer three questions. Firstly, they had to say what are the things they can do with LEAVES. Participants were quite positive regarding all the things that LEAVES offers, like expressing emotions or setting goals. A participant also advised suggesting volunteer work. Nonetheless, all this information is too much and it can be confusing. Secondly, participants were asked what they thought was particularly useful. One participant pointed out that it is good to know that you have someone you can contact if you feel alone. Another participant said that she really liked the diary and she would still want to use this program after many years that she lost her spouse. Lastly, participants were asked what they think is not useful in the program. On the contrary to the opinion of P2, P1 would not like to keep a diary because he thinks that it is too personal. P2 thinks that things should not be obligatory and users should have some freedom in choosing what to do within LEAVES.

5.3.1.3 Part 3: Privacy design

In this part, participants were asked to look at some privacy statements and answer four questions. Most participants felt a bit uncomfortable with statement number three which explained to the user that they were going to be regularly asked how they felt. P1 said that he found it as a *“big privacy breach”*. Another participant said that she understood what data is collected, but she was not sure if people would have wanted their data sent to their therapists and/or doctors. Nonetheless, she understood that it was important that the system could monitor them and send data to third parties. To the question about the data which were going to be collected, participants knew that their general personal information was going to be collected. However, P1 thought that it was not LEAVES' task to collect such data whilst another participant said that it could help, but she was not sure if she was completely comfortable with it.

5.3.1.4 Part 4: Willingness to Pay

In this part of the study, participants were asked the value they saw in LEAVES and how much they would have been willing to pay. To the first question, a participant said that LEAVES could facilitate the mourning process people are going through. Another participant said that she thought that LEAVES is a nice way to monitor how it goes with people and that diary could really be beneficial. Lastly, another participant said that she liked the fact that she could go through the program in her own time. Additionally, most participants said that it would be nice to have the program personalised. For instance, according to *“my own level of intelligence, my personality, and situation”* (P3).

As participants were asked how much they would pay for this service and in which way, they said 95 euro per month, 100 euros per year, and nothing. This last answer was given because the participant thought that people would want to know what is the real added value before paying for it. Additionally, one participant said that it should depend on what people need and, accordingly, she said that there should be a subscription which should be stopped whenever she wants. Another participant said that it should depend on the financial situation of the user, but she would like to only pay one time. Lastly, participants think that this service should be advertised in doctor offices, or in locations that are used for funerals (like church), or via health insurance companies. The information could be given, in these locations, via flyers or word-of-mouth.

5.3.2 Portugal

In this chapter, the results of the end-user testing conducted in Portugal were described. The results are divided according to the scenarios presented in the protocol.

In general, different from the other countries, in Portugal, the role of family members or a close friend was central to facilitate the use of LEAVES and to have someone nearby for emotional support. Moreover, when conducting the end-user tests, a family member was present, and (s)he presented concerns regarding the emotional damage that participating in this study could give to them.

5.3.2.1 Part 1: Onboarding and main functionalities

By looking at the first scenario of the LEAVES prototype, all participants felt that this part was quite unclear and confusing. Additionally, they requested high support to understand LEAVES functionalities and navigate through the service. Nonetheless, as a positive aspect, one participant said that the prototype had a good and pleasant aesthetic.

After having seen the first scenario, four questions were asked. Firstly, two participants said that it was hard for them to recall the character. One of them thought that 'Sun' is the researcher behind LEAVES. Nonetheless, when they were told again who 'Sun' is, they said that the name represents warmth and comfort. One participant did not understand the concept and did not want to reply to the question. Secondly, participants were asked what the purpose of scenario 1 was. One participant did not know what to answer. Another participant said that this scenario had the purpose to make it clear to the user that there are friends who can always help her or him. Finally, a participant said that the purpose was to create a bond with the user. Thirdly, when participants were asked if they felt comfortable interacting with such a technology, most of them said that they would prefer to talk to a real person and one said that (s)he was unsure. The last question asked participants if they would rather do this program alone or with a friend. All of them said that they would prefer to use LEAVES with someone else.

5.3.2.2 Part 2: Study session

5.3.2.2.1 Scenario 2.1

In this part of scenario 2, a screen was shown where the user was asked to think about how relationships changed after the loss of his or her spouse. When thinking out loud, one participant said that it would be very difficult, emotionally and cognitively, to answer this question. However, one participant said that this question makes you reflect on how relationships change over time. On the contrary, one participant said that (s)he would not write anything because no relationship changed. Most participants were glad to end this part of session 2 and start with the other part.

When asking participants how they preferred to work with such technology (writing by hand, typing on the screen, speaking, or taking pictures), three different answers were given. One of them would rather write everything by hand because it feels more personal. One participant would like to talk because it feels like (s)he is freer with her or his thoughts. The last participant would like to type directly in LEAVES.

5.3.2.2.2 Scenario 2.2

In the second part of Scenario 2, participants could look through all different sections of LEAVES, like the diary part, or the activity page, or the 'my support' page. All participants thought that LEAVES should be simple and not too complex. One participant suggested having a calendar with an overview of the days and the activity or task they did each day. Another suggestion was to change the order of the top buttons by putting the study section before the diary. Most participants liked the diary because they thought it was a good way to organise thoughts and feelings. Moreover, most participants liked the activities page more than 'My Support' page and the 'Study' functionalities and they thought that it was nice to have some inspiration.

For this part, three questions were asked. Firstly, they were asked what it is possible to do with LEAVES. All participants focused on the fact that LEAVES should be simple. Most of them also said that the text should be in a bigger size. Two participants said that LEAVES allows them to express their emotions in different ways. Regarding the activity and diary parts, most participants thought that those were really valuable sections and the activity section could activate and motivate them. One participant said that LEAVES is valuable because (s)he can be alone and do what (s)he wants without having someone to judge him or her. Additionally, LEAVES could help to focus on the simple good things a person has in life. Nonetheless, one participant said that (s)he found the part asking about relationships quite confusing and out of the blue.

Secondly, all participants found really useful the inspiration given in the activity section. Most participants also thought that it can be important and helpful for users to write a diary, think about the people who can support them, and read information about grieving. Furthermore, one participant said that it is nice to have a list of people who can support and help the user in moments of need.

Lastly, participants were asked what they did not find useful. Most participants said that the program and what it offers should not be obligatory and people should be able to choose what to do. Additionally, even if the activities section would be nice, there is too much information which makes that part confusing and overwhelming.

5.3.2.3 Part 3: Privacy design

After having read the privacy statements, participants were asked four questions. Firstly, they were asked their general impression of the questions. Two participants said that they agree that they need to give permission before LEAVES collects data from them. One participant was positive about the statements and that (s)he would trust the program. Nonetheless, another participant had concerns with the user's privacy and the use of data for other purposes. One participant said that these statements seemed too informal which sounded less reliable and trustworthy.

Secondly, participants were asked if they knew what was going to be collected. Most of them knew that it was about the collection of general information about themselves, like email address, age, etc. but, also, about the symptoms the user has.

Thirdly, when participants were asked if they found these statements concerning, one participant said that (s)he would not like to give the information to doctors and therapists. In addition to this, a participant did not like the idea of giving personal information to LEAVES and someone advised to make different consent for different types of information. Another participant said that it was not clear what and how information about the contacts was going to be used. To the last question, only one participant felt comfortable with LEAVES collecting this information.

5.3.2.4 Part 4: Willingness to Pay

In the last session of the study, people were asked to answer a few questions regarding their willingness to pay for LEAVES and the value that they saw in the program. Firstly, when they were asked the adding value of LEAVES, a participant said that it could help people to cope with the loss of someone and feel better. Moreover, one participant said that it could help to have individual space for grieving. Participants gave different answers regarding the payment method for LEAVES. Someone said that (s)he would pay 30 euros once and another participant said (s)he would pay 50-75 euros once which is the average price of a psychology consultation. One person said that it should be free. Additionally, most participants said that they would also have a subscription to LEAVES, but they would want to have the possibility to stop it whenever they want. Lastly, as participants were asked which places they would think the most suitable to find LEAVES, they said the doctor or the local health centre.

5.3.3 Switzerland

This chapter presents the results of the end-user testing in Switzerland. The results were divided according to the scenarios described in the protocol. Additionally, in Switzerland, an extra question was asked to the participants who were also recruited for the first round of the end-user testing. The enumeration of the participants is according to the order they were interviewed.

5.3.3.1 Part 1: Onboarding and main functionalities

When looking at the first scenario of the prototype, three participants did not find difficulty interacting with it. However, most participants thought that it was unclear why they had to fill in the names of people who can support them. They just wanted to go on with looking at the program. A participant suggested that it would be nice to be able to do this action afterward. P7 said that he thought that *“it is a personal thing”* and that he knows that those people are there if he needs them. On the contrary, two participants are fine with filling in the names of people and they trust the program. P8 said that there is too much text and she would advise to put important things in bold or leave out parts of the text which are too obvious or not that important.

After having seen the first scenario, four questions were asked. When participants were asked who they thought ‘Sun’ was, four participants did not recall the name. After the researcher told them, different answers were given. Two participants still did not know what to answer and two participants thought that it was the person who made the program. Two participants knew that it was not a person, but the name of the program or *“the voice that is speaking to her through the program”* (P10). Nonetheless, one participant said that the name is *“very appealing and promising”* (P11) and it feels that ‘Sun’ will help her to see the sun in her life again.

Secondly, participants were asked what the purpose of this task was. Some participants said that they thought that this program could help them to not get lost in their *“tangled thoughts”* (P10) or their grief. Additionally, some participants thought that this program could help people to go through the loss of someone in their family and to let people know that they are not alone and that they can find help. Two participants were eager to go on seeing the rest of the program.

Thirdly, participants were asked if they would feel comfortable interacting with such a technology. All participants said yes and most of them said that, with how the world is changing, it is useful to have these kinds of technologies and it is good that they get used to them. However, some participants still had some doubts. One participant who had seen the previous version of LEAVES thought that this version was better, but she would have liked a bit more colours and different font size. Another participant would still prefer to talk with a real person, but he thinks that both options together, so blended therapy, would work fine with him. He is curious to know if a program without a soul could be able to give the same help as a human being.

Lastly, to the question about doing this program alone or with someone else, most participants said that they would rather do it alone. This is because it is something personal and because they would get distracted and feel judged if they were to do it with someone else. Nonetheless, one participant said that if a person is quite old or already has some mental issues, (s)he may need help from someone else. Finally, P7 said that he would like someone else comforting him if he breaks into tears.

5.3.3.2 Part 2: Study session

5.3.3.2.1 Scenario 2.1

After looking at this scenario, participants were asked how they would like to work on their mourning process, by typing on the screen, by writing by hand, by speaking, or by taking pictures. Different answers were given. Two participants would like to write either on their notebook (P7) or a paper and afterward typing it on the computer in a more orderly fashion (P11). This last participant also would not mind drawing to express her feelings. One participant would like to type their thoughts. Half of the participants said that they would like to speak. One of them said that it would be nice to have a program installed in LEAVES which can directly put in words what the user says. Nonetheless, one participant

was a bit concerned about speaking to the program because he wonders if someone is listening to these recordings and he does not feel comfortable with it. Therefore, he suggested that it should be stated what will happen when the user clicks the speak function.

5.3.3.2.2 Scenario 2.2

Two participants seem glad to have finished reading all the information and they just want to go on with the following sessions. Nonetheless, another participant wants to know what exercises are presented to him and he likes that he can choose which option he likes best. Because of the German translation for Study or Session (Sitzungen), participants were a bit confused. P8 thought that the word referred to face-to-face sessions with other people and, accordingly, another participant thought *“You need a partner to do these sessions”* (P7). In addition to this, a participant said that he needs more structure and he suggested that a timeframe is given as to know how long an activity will take, like *“5 sessions with 30 minutes each”* (P9).

When participants were exploring the different sections in LEAVES, different positive comments were made. Most participants liked the activities section and they thought that they could be inspired by it. Half participants liked the overview of the sections and they immediately knew what they needed to do. P10 thought that the journal could be really useful because it *“helps you give a voice to your thoughts”*.

However, participants also gave some negative comments. Most participants do not understand that they can fill in their activities in the activities section and some of them do not know that they can scroll down to see the rest of the activity proposed. Additionally, there was a problem with the fact that the prototype was already filled in which made participants think that ‘Sun’ was the one responsible for filling in everything. Moreover, four of the participants missed some explanation on top of the page to understand what they need to do in the activities section. P9 said that he would also like to have an overview of all the days to plan activities or tasks.

The fact that the prototype was already filled in by the researchers also created confusion with the section ‘my support’ because people did not understand that the text there was written by the character of the scenario. Because of this, participants asked for more explanation. In addition to this, P9 said that he really missed a *“red thread”* to let him understand the logic behind all the different sections. He suggested having an explanation somewhere about the program, like about the menu bar on the top of the page.

After having seen this scenario, three questions were asked. At the question about what people can do in LEAVES, most participants answered that it can be a help for people who lost someone and need support. The answers of half of the participants were quite similar. They said that LEAVES can show them new possibilities, give them new ideas, broaden the horizon, motivate them, help them to not stay still and get lost in their thoughts, let them write a diary, and reflect on situations. Nonetheless, some participants also said that LEAVES misses some logic structure and it should be really simple. Additionally, a participant suggested that different versions should be created to meet different types of end-users.

Secondly, most participants found the activity and the diary quite useful to be able to get inspired and to reflect on their feelings. Additionally, a participant thought that, in general, LEAVES could help the user to understand what and who really supports her or him. She liked and appreciated the different options that are given. P12 said that he thinks it would be really important to know what to do when *“he is in a hole”*, like calling someone, preparing a favourite meal, etc.

Lastly, when participants were asked which things they did not find useful, four of them said that the section ‘people’ was the least useful. This was because the user knows who she or he filled in, or because the user may not want to be a burden for these people and (s)he may rather talk to a psychologist, or because it is not immediately clear why there is a section for it. Additionally, another participant said that he would rather fill in the section ‘people’ at the end when he knows what the program is about and which people could actually be there for him. Another participant said that LEAVES should also address religion and pastoral care because it felt that LEAVES was not open enough to allow people *“to incorporate their beliefs into their grief work”* (P7).

5.3.3.3 Part 3: Privacy design

When reading the privacy statements, participants had some comments. First of all, the privacy statements were a bit difficult to find and it was suggested to have them in a section on top of the page with all the other sections. Only one participant said that she understood why it may be important to share data with a doctor or a therapist. Without that function, she would not use the program. Nonetheless, all the other participants found the last statement quite controversial. Most participants said that they would like to know who is reading this and a participant assumed that there is someone behind the program who monitors what is going on with the user. A participant does not like the idea of someone unknown who reads everything he writes and says that all the privacy statements should be clearly stated at the beginning of the program.

After having read the privacy statements, participants were asked four questions. Firstly, they were asked their general impressions regarding the privacy statements. The general impression was good, but participants had many open questions. One participant asked whether there is a pin code to protect what he writes down in LEAVES because he does not want his children to read it. Another participant asks if feedback is given back because she thinks that it could be useful to know that she is not talking to a wall and she may feel safer. In general, it should be clear how the data are passed to the therapist or general practitioner and the reason why this is done. Finally, a participant said that it is unclear how safe the information the user fills in is. For instance, he asks if it is secure that no one else except the therapist and general practitioner will read what she writes and that no one will hack the program.

Secondly, participants were asked which data were collected from them. Most participants said that their personal information, such as email addresses, age, identity information, and their symptoms of well-being are collected. However, some participants still feel unsure that LEAVES will only collect the data it promises to. Moreover, a few participants wonder if what they write also needs to be considered as data to be collected. One participant even said that he would like to have another password to secure the diary or personal notes.

Thirdly, five participants thought that these privacy statements were not concerning because they understood that a program like LEAVES needs a certain kind of data to work properly. But part of the statements, in particular for statement three, worried them a bit. A participant worried that their personal information would go into the wrong places. Another participant said that she would trust that her data are secured when forwarded to a therapist or a general practitioner, but then, she would like to have feedback. Finally, some participants mentioned that it should be really clear which data are collected and how trustworthy LEAVES is. A participant said that saying at the beginning who is behind LEAVES could help.

Lastly, all participants said that they are comfortable with LEAVES collecting information from them, but some of them came with some conditions. A participant said that *"it's really just about the people in the background of Leaves that can read my thoughts, that's something I'm not looking for."* (P9). Related to this, another participant said that she really wants to know that who is behind LEAVES is a real trustworthy person who can also give feedback.

5.3.3.4 Part 4: Willingness to Pay

For this part of the study, four questions were asked. According to most participants, the adding value of LEAVES is that it is a program which can be done alone at users' own pace, it can bring people forward, it can help users focus on themselves, and give new perspectives. Additionally, LEAVES can help users not feel alone in their grief and that it can accompany them in their pain and process it. Finally, a participant said that LEAVES could help him to avoid getting lost.

Secondly, participants were asked how much they would pay for LEAVES. Each participant had an opinion: 100. - CHF, 20. - CHF, 30. - CHF monthly, 300. _ CHF, a flat rate of no more than 50. - CHF or 2. - CHF a month. A participant said that it should depend on the financial situation of the user.

Another participant said that, before paying, she would like to have a trial version. Nonetheless, P9 said that *“With people I haven’t chosen myself when I don’t know who is behind that program, I wouldn’t want to pay for it. I think on the internet I would find similar inputs on what to do to feel better for free.”*

Thirdly, very different answers were given regarding where participants would like to find or buy LEAVES. Because of the vast number of answers received, a list can be found here below:

- Internet (x3) with the search string ‘grief counselling’ and then see it very dominantly and see who is behind it.
- Doctor (x3)
- ProSenectute (x3)
- Hospitals (x2)
- Pastors (x2)
- End-of-life care (x1)
- Civil Registry Office (x1)
- Cemetery (x1)
- Every organisation that gives help in life (x1)
- TV (x1)
- Magazines (x1)
- Via Flyers (x2)
- App stores (x1)
- Newspapers (x1)
- Radio (x1)
- The local authority (x1)
- Therapist (x1)
- Seniors’ sites (x1)

Lastly, when people were asked how they would prefer to pay for LEAVES, most participants said or monthly or one-time payment. The last answer was given because people *“don’t want to think about subscription, that seems too impersonal to me”* (P9) and because more payments could be bothersome. Additionally, some participants said that it should depend on the participant and their financial situation which is already hard to manage in these situations. Therefore, different options should be given, like a one-time payment for who is sure to use it, or monthly for who wants to first try it out, or per use, or offer a subscription of 10 weeks.

5.3.3.5 Part 5: Differences between the two different prototypes

In Switzerland, three participants had also participated in the first round of end-user testing. Accordingly, it was asked to them what was the biggest difference between the two prototypes and which one they liked best. One participant said that she liked the first version better because it was simpler and slower. Nonetheless, the other two participants said that they liked the second version more because it *“looks more scientific”* (P8) and because it does not have an avatar anymore which makes it look more *“neutral”* (P11). However, they think that the second prototype still misses something. P8 said that that the font of the second prototype is too small and the most important sentences should be somehow highlighted. Moreover, P11 said that the second prototype has a better structure, but she finds the design rather boring: it misses more colour and some animations. Additionally, *“inviting presentation and appealing appearance of the platform that represents Leaves are missing”* (P11).

5.3.4 Summary

Twelve sessions to test the M12 prototype were organised among The Netherlands, Portugal, and Switzerland. In general, the results turned out to be quite similar for all countries with the exception that

in Portugal, a stronger focus on the importance of family members when people use LEAVES was found.

5.3.4.1 Concerns

One of the major problems of this prototype is that the virtual agent 'Sun' is not recalled by participants. This means that this character does not make a big impact when it presents itself. Nonetheless, many participants found the name of the character as a sign of light at the end of a dark period, and for some of them, it represented warmth and comfort.

Another big problem that was identified by most participants was the lack of structure throughout the whole prototype. During the onboarding session, participants were overwhelmed by the amount of information and the questions they were asked. Additionally, all the questions within LEAVES were found to be a bit too long. Participants also missed a sentence where it is said to them how long a task, an activity, or a session is going to take. They need to know it in order to organise their time and choose which activity to do. Moreover, some participants said that it would be nice to have a calendar to see where they are in the process and when they have something planned. Finally, overall, participants said that the order in which they were presented the sessions was not logical. They expected to have the privacy statements at the beginning and the filling in of the contact persons or reflecting on their relationship afterward. Furthermore, the buttons on the top of the page, in their opinion, are not in a logical order and they would like to have an explanation of all the buttons: what they mean and how to get there. This also means that the prototype should be simpler and self-explanatory.

Additionally, regarding the aesthetic of the prototype, there were some nice comments, but the participants who had seen the first prototype said that there should be more colours and animations. Additionally, the font of the prototype should be bigger and the most important things that the user needs to read should be in bold or somehow highlighted.

Another problem some participants had was with the session in which they had to fill in their contact persons and the 'people' section on the top of the page. Some participants understand that it is important to know who you can contact in moments of need, but most participants do not want to be a burden for other people and they may first want to think about who to choose as a contact person. Finally, once they know who they want to contact in troubling moments, some think they do not need a section for it.

All participants had (some) concerns with the privacy statements, in particular statement number three which explains to people that they will be regularly checked and that their data will be sent to a therapist or general practitioner. Even if some participants understand why it is important that the users are monitored, they get anxious by the idea that their data is going to be sent to third parties and that they may not even receive feedback back. Additionally, they found the statements unclear and someone thought that the language used was a bit informal which made the statements lose credibility. Regarding the privacy statements, many questions were asked about the people behind LEAVES and how the data collection works. Many participants asked to have a professional to help them do this program because they have mixed feelings about LEAVES as the only support to process grief.

Regarding the scenario about willingness to pay, participants had many different opinions which also differ per country.

The last major problem regards the way the LEAVES team represents itself in the prototype. There was not a clear initial explanation of who is behind this project and how this prototype was created. This led to a decrease in the credibility and trustworthiness of the program.

5.3.4.2 Value of LEAVES

LEAVES can really be of help for people who lost their partner and have a hard time going through the mourning process. Accordingly, most participants said that the added value of this program is that it can be done independently, at the users' own pace and time. Additionally, it can help the users to

understand who are the people who can be there for them if they need it which also lets them feel that they are not alone. Related to this, LEAVES can help people when they feel lost.

LEAVES is a program that can make users reflect on their feelings by means of a diary or by doing some activities. These sections of the prototypes were liked by most of the participants because they were seen as inspiring and useful for reflection. Therefore, LEAVES was seen as a program which can offer a wide range of ways to process grief, but participants said that they would still like to be able to choose what to do within the program. Furthermore, some participants said that it would be nice to have this program personalised according to the users' needs, situation, and personalities

5.3.4.3 Limitations

Whilst doing this study, some limitations were found. Most of the interviews were conducted online due to the COVID-19 pandemic. Because of this, it happened that sometimes researchers had some struggles with guiding participants through the whole prototype. This may have caused some confusion for participants.

The current version of the LEAVES prototype has the blank spaces which the user is supposed to fill in already completed. This resulted in participants only being able to interact with the prototype by clicking on buttons. Moreover, it created confusion for some participants because they did not know who had filled in the information: if it was the user, or 'Sun', or the programmers behind LEAVES.

Another remark to make is that the answers to the question in session 2.1 may have differed depending on what the user was looking at. Accordingly, it may have happened that, for some, this question looks general which resulted in participants saying that they prefer writing by hand. Moreover, not being able to write on the prototype did not allow participants to imagine the actual interaction.

Finally, the predominant language within the LEAVES project is English and when the prototype was translated to the other languages, some words felt unclear for participants. Accordingly, more attention should be paid to the way certain words are translated.

5.4 Implications for technical development

These results have some implications for the technical development of LEAVES. Regarding the **design**, the prototype should overall have more **structure**. Some suggestions which were given to tackle this problem were:

- Dividing big questions into small questions,
- Saying how much time activity or a module will last, and giving direct and clear explanations.
- For the aesthetic of the prototype, there should be more animations, or pictures, and some colourful features.
 - 'Sun', as a character, should be more present around the whole prototype.
- There should be less text because users could feel overwhelmed by the amount of information. A solution could be having the most important information in bold or highlighted.

More structure also implies making the prototype more self-explanatory for this target group (elderly people). An implication of this could be given the user more **support** during the onboarding process. This user support can be in the form of instructional video, written manual, or within the prototype, like with pop-up buttons and information buttons.

Regarding the **content** of LEAVES, these results bring the following implications. At the beginning of LEAVES, it should be made clear **who** are the people behind the program to increase credibility and trustworthiness. Moreover, users should clearly know, from the beginning, how their **privacy** is respected in LEAVES and how data is collected. Therefore, privacy statements should be formulated differently. Finally, there should be more emphasis on the **help** LEAVES want to give users and the reasons behind the modules or activities should be explained.

5.5 Implications for exploitation (if applicable)

For this end-user testing, some questions were asked about the added value of LEAVES, the channels that should be used to promote LEAVES, and the amount of money a user is willing to pay LEAVES. The information retrieved can be used to create the value proposition and the business model for LEAVES. However, because it was noticed a difference among the three countries regarding the channels to use and the amount of money a user is willing to pay for the program, it is to consider if a business model should be **different per each country**.

Finally, some comments were given regarding the moment in which a mourner can actually benefit from LEAVES. It seemed that the character of the scenario, who had just lost her spouse, would not have been ready to use LEAVES. Therefore, the **timing** when offering the program to users could be an important factor for an efficient implementation.

Iteration 3: M18 Prototype

5.6 Objectives

The M18 prototype is the MVP of the LEAVES service in the month 18th of the project. This contains all functionalities, a full onboarding process, and one fully elaborated study module ('Fostering Positive Thoughts and Emotions').

The goals of this test are:

1. To discover usability issues in the current MVP, precisely:
 - a. Usability and user experience of the onboarding process;
 - b. With the general navigation through the prototype;
 - c. In the interaction with the virtual agent 'Sun'
 - d. Usability and user experience whilst working through the study module.
2. To understand the perception of the virtual agent 'Sun' in the prototype;
3. To understand participants' opinions regarding the value of LEAVES as a product.

5.7 Protocol

Older adults (60+) from the Netherlands, Switzerland, and Portugal, were recruited for a face-to-face session. They did not need to have lost their spouse in order to participate in this study. During the testing, the protocol in Appendix F was used. Before starting this session, they were asked to sign an informed consent form to agree about the usage of the information provided for research purposes. Additionally, they were asked to fill in two questionnaire: one about their demographic data (Appendix D) and one about their health literacy (Health Literacy Scale, Appendix E). Afterwards, the scenario of Monika was read to the participants to allow them to better understand the situation of a person grieving the loss of her partner.

Overall, the testing included three tasks: going through the onboarding, finding the study page from the homepage, and going through the study module about "Foster Positive thoughts and Emotions". After each of this task, participants were given the After Scenario Questionnaire (ASQ) (Appendix G) to measure their satisfaction with the task and they were asked a few questions about what they had just seen in the prototype. During these tasks, participants were asked to think out loud to allow the researcher to understand their way of thinking.

At the end of the study, they were asked some questions regarding their willingness to pay for a service like LEAVES and they were asked to fill in the System Usability Scale (SUS) (Appendix H) and the eHealth Usability Benchmarking Instrument (HUBBI) (Appendix I). The SUS is a scale to measure usability developed by Brooke (1996). The HUBBI is also a usability scale, but it explores usability with seven components: Basic System Performance, Task-technology Fit, Interface Design, Navigation & Structure, Information & Technology, Guidance & Support, and Satisfaction. This was developed by Broekhuis, van Velsen, Peute, Halim, & Hermens (2021).

Once all the sessions were finished, parts of the sessions which presented the usability issues were transcribed and translated to English. Afterwards, the issues were added in three excel files (one per country). Two researchers worked on the formulation of the issues and on the analysis of the quantitative results. Finally, the issues were merged by also deleting redundant issues.

5.8 Results

A total of 16 people were recruited: 5 in the Netherlands, 6 in Switzerland, and 5 in Portugal. An overview of the characteristics of these participants can be found below in Table 4:

Table 4: Demographic of participants M18

Participant	Nationality	Age	Gender	Health Literacy	Educational level	Digital devices	Lost someone
P1	Dutch	68	f	3,3	Vocational education	Smartphone, PC/Laptop, Tablet	Unknown
P2	Dutch	78	f	4,0	Higher vocational education	Tablet	Partner
P3	Dutch	78	f	4,7	Higher vocational education	Smartphone, PC/Laptop, Tablet	Partner
P4	Dutch	81	f	3,0	Secondary education	PC/Laptop; Tablet	Partner (x2)
P5	Dutch	75	f	4,7	Higher vocational education	Smartphone, PC/Laptop, Tablet	Partner (may 2021)
P6	Swiss	67	m	3,0	Vocational education	Smartphone, PC/Laptop, Tablet	Unknown
P7	Swiss	72	f	4,3	Higher vocational education	Smartphone, PC/Laptop, Tablet	Unknown
P8	Swiss	66	m	4,0	Higher vocational education	Smartphone, PC/Laptop, Tablet	Unknown
P9	Swiss	69	f	2,3	Primary education	Smartphone, PC/Laptop	Lost parents as a child

P10	Swiss	79	m	3,3	Pre-university education	Smartphone, PC/Laptop, Tablet	Lost his daughter
P11	Swiss	63	f	4,7	Lower vocational education	Smartphone, PC/Laptop	Lost someone recently
P12	Portuguese	73	f	4,0	Higher vocational education	Smartphone, PC/Laptop, Smartwatch	Unknown
P13	Portuguese	60	f	4,0	Secondary education	Smartphone, PC/Laptop, Tablet	Unknown
P14	Portuguese	73	f	3,3	Primary education	Smartphone, PC/Laptop, Tablet	Unknown
P15	Portuguese	60	f	3,7	Lower vocational education	Smartphone, PC/Laptop, Tablet	Unknown
P16	Portuguese	-	m	1,0	Higher vocational education	Smartphone, PC/Laptop, Tablet, Smartwatch	Unknown

The following subchapters will present a general overview of usability issues found and of the quantitative results. Afterwards, per country, particular issues, the quantitative results, and the willingness to pay will be presented. Additionally, a summary will be given. In the last chapters, the general implications of the results will be presented.

The issues will be divided according to their severity:

- *Minor issues* occurred infrequently among the participants and/or the problem only increased task completion time slightly.
- *Serious issues* occurred frequently among the participants and/or the problem severely increased task completion time.
- *Critical issues* occurred when all participants had the same problem and/or the problem prevented participants from completing tasks.

5.8.1 Usability issues

A total of 143 usability issues were found. After deduplication, the final usability issues were 66 (Appendix J). Of these 66 issues, 34 were minor, 26 were serious, and 6 were critical. The critical issues and some examples of serious and minor issues are given below with some quotes from the participants.

All the critical issues are:

- The registration for new users' option is not clearly visible on the homepage.

'I would just fill in my email address and password.' (P3)

'I think that I have to fill in my email address, then I would just do that. This is here on the top, so you begin with that.' (P1)

- The onboarding process of the LEAVES application is considered too long and elaborate for the user.

'Too much text to read. [...] I would just want to push it away' (P4)

'There is a lot of text to digest. Especially for people who are grieving. Could be supported with something that makes it more alive. Something visual. At the moment I am simply clicking continue, continue, continue' (P6)

- The LEAVES application uses words and sentences that are too difficult or scientific for the user.

'I find these ones here difficult words. You do not use them in everyday life.' (P3)

- There is too much text in the module 'fostering positive thoughts and emotions' for the user to go through.

'I find the text really long. If I am someone who lost a partner it is very long...' (P7)

- The user could not find the self-study module in the LEAVES application
- The user does not know how to go back to the onboarding process from the Admin section.

Some examples of serious issues are:

- The LEAVES application provides the user insufficient information about the program
- The questions in questionnaire 2 are difficult to interpret for the user.
- The 'my support' button in the header does not show on the screen when the LEAVES application explains about it in the onboarding process.
- The user does not understand the character 'Sun' in the LEAVES application.

'«Sun» No clue who this is. Have not paid particular attention to it.' (P9)

- The character 'Sun' is not clearly visible in the LEAVES application.

'Who is this? Ah, there it is shining, the sun. I somewhat brushed over it. It seemed a bit weird to me, a bit technical. That makes me wonder if I am maybe already too old. These bots, that are available on many sites, it is hard to keep up with them. Even though I am good with technology, I don't personify it. Avatars or AI are not for me. LEAVES is nothing but a website for me.' (P8)

- The exercise page in the module 'Positive thoughts and emotions' is unclear as there is a long introductory text before explaining the exercises the user has to do

Some examples of minor issues are:

- In the onboarding process there are words like 'conversations' and 'we' which give incorrect expectations about how the system will support the user (that there is a person behind the system).

'I expected to have contact with someone. I expected a personal conversation with someone or via the computer with a voice. And sometimes, I will ask how it is with you.' (P1)

- The user does not understand the meaning of the button 'Send'.

'Where am I sending this now?' (P6)

- The text in the picture in the lecture about 'Emotion Regulation' is not big enough.
- The phrase 'well done' in the dialogue after the exercise page in the study module 'positive thoughts and emotions' is unclear to the user as it does not explain what the user has done well so far.

'Well done... but what have I done well now?' (P6)

- The answers to the questionnaire 2 are not in the correct order, precisely 'many or most of the days' should go after 'half of the days' and not before.
- After reading the privacy statement the first time, reading the privacy statement a second time during the onboarding process feels redundant for the user

5.8.1.1 Usability scales

To quantitatively test the usability of the LEAVES prototype, the SUS and the HUBBI were used. The average score of the SUS was **67,5** (missing values = 2). The average score of the HUBBI was **3,6** (missing values = 9). However, for the HUBBI, it is relevant to look at the score of the seven components (Basic System Performance, Task-technology Fit, Interface Design, Navigation & Structure, Information

& Technology, Guidance & Support, Satisfaction). Here below (Figure 2), a graphic representation of the HUBBI results per component per all three countries is given.

These scores show that, in general, the LEAVES application scores just above average in terms of usability. Additionally, according to users, there were not many problems which were caused by the functionality of the system itself (score of 4,4). The lowest score was the one for Guidance & Support (score of 3,3), which means that participants did not always feel that they were helped when they found problems with the LEAVES application or they did not feel that the system helped them to manage their health. Nonetheless, this score was still above average.

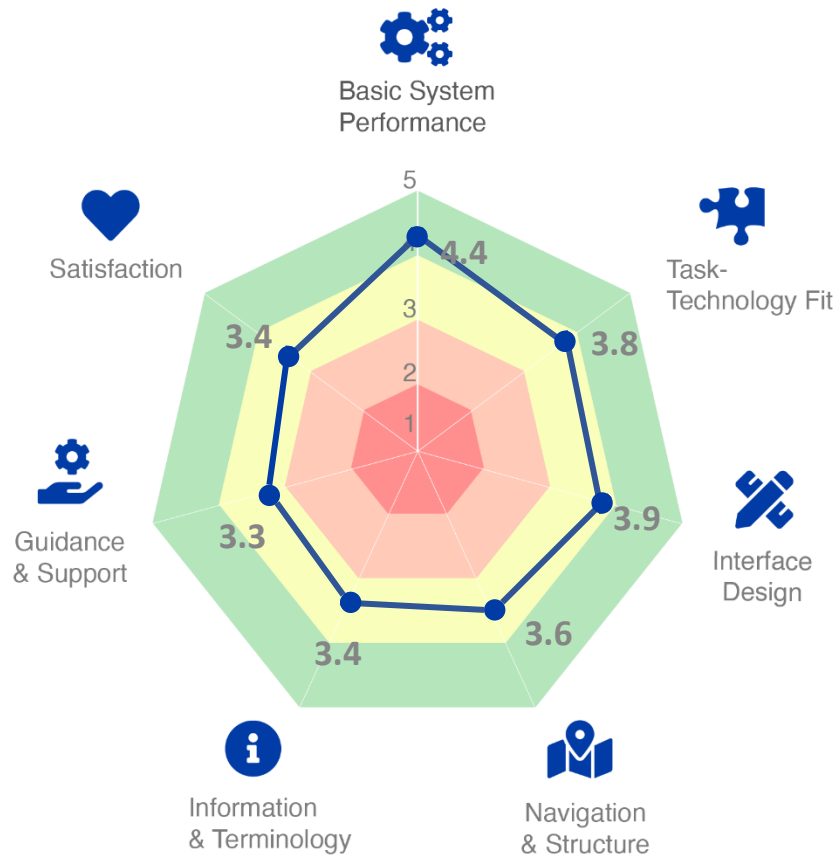


Figure 2: General HUBBI scores of the LEAVES application

5.8.1.2 Task completion:

All participants had to perform three tasks:

1. Going through the onboarding process (Table 5)
2. Getting to the study module from the homepage (Table 6)
3. Going through the study module (Table 7)

In the tables below, it is presented, per task, how participants performed these in terms of completion, time, and satisfaction. Participants in Switzerland and Portugal did not have any problems performing the second task and that is why the questionnaire was not given or the time was not taken. However, in the Netherlands, participants had some problems with the second task (Table 6). This was

partly because they could not understand what they had to do due to low technological literacy. Nonetheless, in general, participants were quite satisfied with how they perform the tasks.

Table 5: Participants' satisfaction with task 1

Country	Task completion rate (%)	Av. task completion time (sec.)	Task satisfaction
NL (N=5)	100%	1978,4	5,5
PT (N=5)	100%	756	6,0
CH (N=5)	100%	940	5,4

Table 6: Participants' satisfaction with task 2

Country	Task completion rate (%)	Av. task completion time (sec.)	Task satisfaction
NL (N=1)	100%	5	2,7
PT (N=4)	80%	Unknown	4,4
CH (N=1)	100%	Unknown	7,0

Table 7: Participants' satisfaction with task 3

Country	Task completion rate (%)	Av. task completion time (sec.)	Task satisfaction
NL (N=5)	100%	896	4,9
PT (N=5)	100%	804	5,9
CH (N=5)	100%	390 (only known of N=3)	5,0

5.8.1.3 Extra non-usability issues

During the usability issues, other possible issues regarding the user were found. These were divided in motivational and trust issues.

Motivational issues:

- The user does not want to read the privacy statement.
- The user does not want to enter personal information to the LEAVES application.

Trust issues:

- The user does not trust the LEAVES application.
- The user does not like it that therapists or doctors could have access to her LEAVES account.

5.8.2 The Netherlands

5.8.2.1 Particular issues

Besides the already mentioned issues, in the Netherlands, participants found the translation from English to Dutch not appropriate. This was for mainly two reasons. Firstly, it was because of the use of English words. As it was mentioned, for instance, by P3, *‘Privacyverklaring’ [Privacy statement] is an English word that has been just put here in Dutch.* (P3). Secondly, it was because the words used were not considered appropriate for the Dutch culture. For example, some participants said that the word ‘begeleiden’ translated from the word ‘guide’, with the meaning of support, felt that the system was the one in control: *‘It makes me angry because there’s a computer that’s going to guide me through something so big. So come on, don’t say this. Guiding is the wrong word. Want to help, preferably.’* (P2).

Additionally, all Dutch participants thought that saying ‘I am sorry for the loss of your partner’ was not something that people say to a person grieving. To quote some participants: *‘It is funny, I find it hard that it is sorry. It does not sound like you are sorry at all. You find it difficult.’* (P2)

“I am sorry you lost Jeremy”. It is weird. It could be better: my condolences on your loss. They do not know Jeremy, do they?’ (P5)

Furthermore, in the Netherlands, participants struggled with the terms and icons used to navigate the LEAVES application, like Menu, My Support page, or the Account page. For instance, P3, as she was reading about where to find information about her account in the onboarding, said: *‘No idea what My Account page is’.*

Finally, another prominent issues found in the Netherlands was that, as participants were asked who Sun was, no one really knew it.

5.8.2.2 Usability scales

The score of the SUS in the Netherlands was **62,5** (missing values = 2). The average score of the HUBBI in the Netherlands was **3,6** (missing values = 1). In Figure 3, the scores of the different

components of the HUBBI are shown. Overall, these scores can be considered quite good because above average.

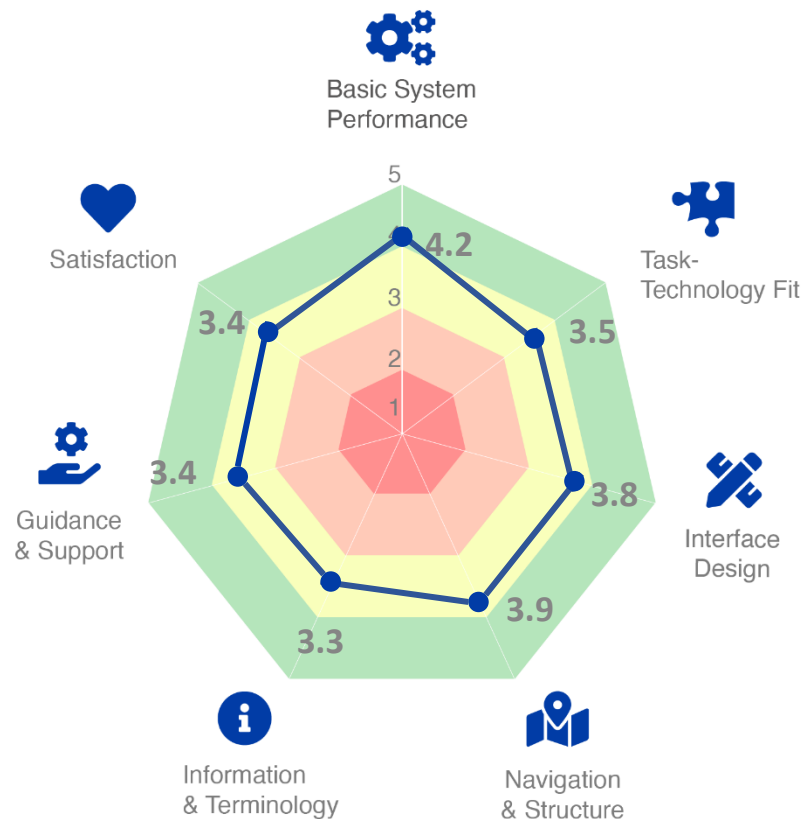


Figure 3: Dutch HUBBI scores for the LEAVES application

5.8.2.3 Willingness to pay

At the end of the usability testing, participants were asked if they would consider using LEAVES and how much they would pay for the service. Regarding the usage of LEAVES, four participants said that Monika would use LEAVES. The one participant who said that she would not use it explained herself by saying that *'a person who is just grieving is already having too much load.'* (P3).

Regarding their willingness to pay, three participants said that the payment should depend on users' income and her financial situation. P2 explained herself by saying that *'a person in grief already needs to pay for many different things, like the funeral and so on and thinking that she also needs to pay to be helped is too much.'* One participant mentioned the amount of 10 or 20 euros per month and another one of a maximum of 50 euros.

5.8.2.4 Positive comments

During the usability test in the Netherlands, participants also had some positive comments:

- LEAVES can bring good results.
- In the privacy statements, there is good information.
- The first lecture of the module 'Fostering Positive Thoughts and Emotions' looks nice and some participants think that they can recognize what is written there and it is interesting.

- The exercises are an important part and they could help. They are nice, logical, and relatable.
- A participant was curious to go on with onboarding and making an account and see the rest.
- In general, it is easy to go through the program.

5.8.3 Portugal

5.8.3.1 Particular issues

In Portugal, no prominent issues were found, also because the people who participated in the usability testing were used to this kind of studies with technologies. However, two participants noticed that the answers in the second questionnaire of the onboarding were not in the right order, precisely that ‘many or most of the days’ needed to go after ‘half of the days’ and not before. Finally, most participants could not recall and understand who Sun was.

5.8.3.2 Usability scales

The score of the SUS in Portugal was **67** (missing values = 0). The average score of the HUBBI in Portugal was **3,7** (missing values = 3). In Figure 4, the scores of the different components of the HUBBI are shown. Overall, these scores can be considered quite good because above average.

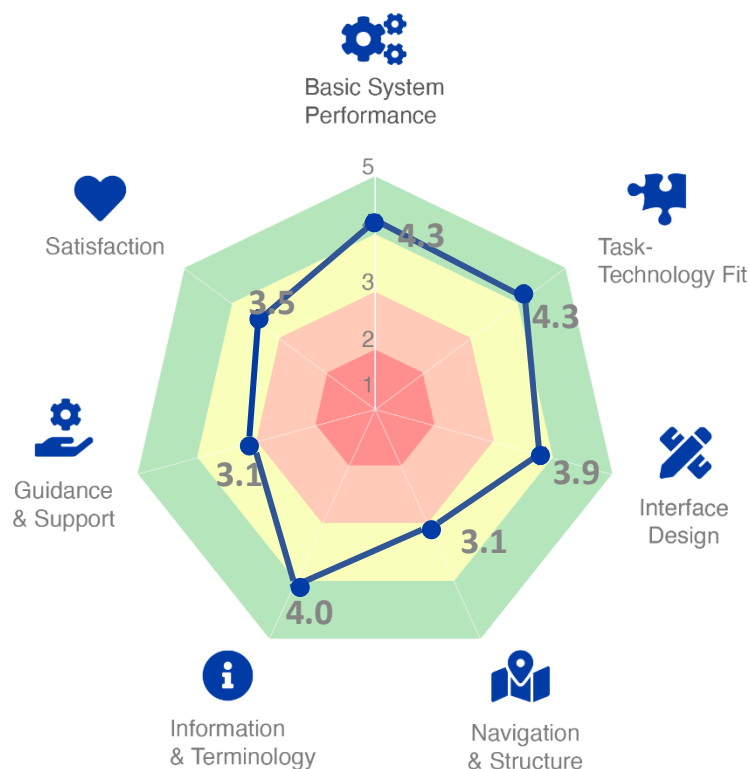


Figure 4: Portuguese HUBBI scores for the LEAVES application

5.8.3.3 Willingness to pay

At the end of the usability testing, participants were asked if they would consider using LEAVES and how much they would pay for the service. All participants would use this service and some of them may be even willing to pay for it. However, all participants mentioned that most health services in Portugal come from the national health system and, accordingly, they think that LEAVES should also come from there.

Furthermore, people are not used to pay for those services and, because of this, there are not comparison services to think about how much LEAVES could cost. Finally, they would expect support the first time they use LEAVES, so for the first part of the onboarding.

5.8.3.4 Positive comments

In Portugal, some positive comments were also given regarding the LEAVES prototype:

- The personal way of being approached is nice.
- The onboarding part relatively easy to navigate
- The onboarding has some nice interaction points
- The diary notes is a good idea
- The user liked the aesthetics
- Some users enjoyed reading the text and learning from it

5.8.4 Switzerland

5.8.4.1 Particular issues

In Switzerland, some more prominent issues were found. The first one was that the user does not really understand or relate to the character Sun. Most of them know that it is a virtual agent, but they just do not understand their function. Another issue found during the Swiss testing is that the participant does not know how to get the back from a website page to another. For instance, P8, as looking the account page, said: *'How do I get back? I am missing the "Back Button" a bit.'*

Some participants had a problem with the word 'Admin' for the account page. As reading this word and being told to go to this page for more information about their profile, they did not know where to click. Once they understood what it meant, they just did not think that it was a suitable word.

By going through the onboarding, one participant found a loop in the way information about LEAVES are presented. If the user wants to get all the background information available, there is always an option to know more about it and after a certain point, the information repeats itself and the same options keep returning. This issue is linked to the issue about the onboarding being too long and elaborated.

5.8.4.2 Usability scales

The score of the SUS in Switzerland was **72,9** (missing values = 0). The average score of the HUBBI in Switzerland was **3,6** (missing values = 5). In Figure 5, the scores of the different components of the HUBBI are shown. Overall, these scores can be considered quite good because above average.

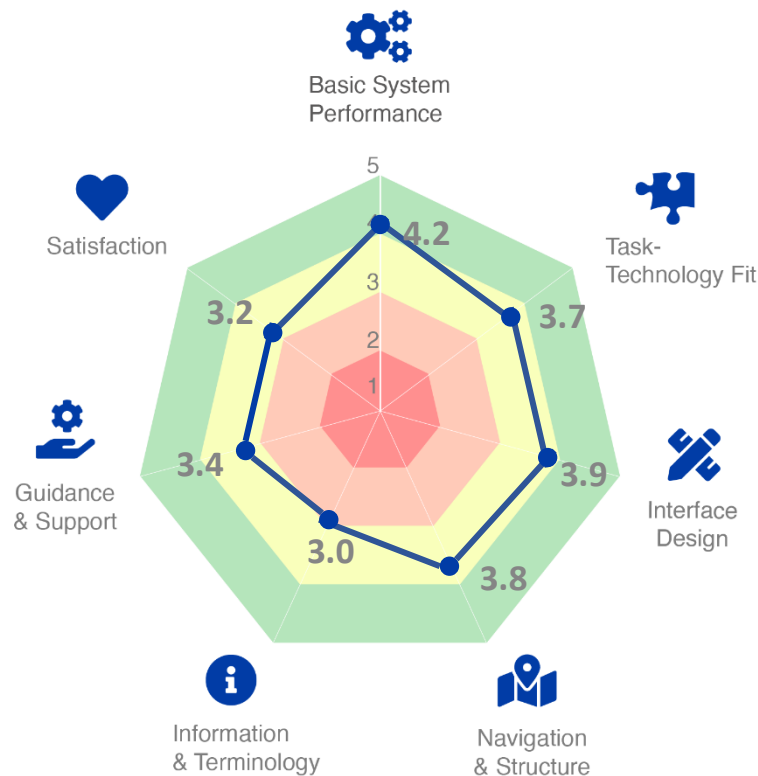


Figure 5: Swiss HUBBI scores for the LEAVES application

5.8.4.3 Willingness to pay

At the end of the usability testing, participants were asked if they would consider using LEAVES and how much they would pay for the service. Three participants said that they would not use the service, even if it was for free. Additionally, they would expect this service to be funded or paid by the state. Participant 6 immediately said that she would use the service and also recommend it.

Two participants said that they would pay for this service because, as, for example, P5 mentioned, it would be better *“than having it filled with “nervous ads”*. No participants mentioned an exact amount of money, but some mentioned that that it would be nice to have a regular payment, like monthly or yearly.

5.8.4.4 Positive comments

In Switzerland, only a few positive comments were retrieved from data:

- Besides some foreign words, the text in the module ‘Fostering Positive Thoughts and Emotions’ was easy
- A participant would use the notebook because it seems better than using a piece of paper

5.8.5 Summary

Overall, the LEAVES application scored above average in terms of usability. The main problems found were:

- The onboarding is too long
- The language and terms used are considered too scientific or/and too difficult and/or too technical
- The amount of text in the module 'fostering positive thoughts and emotions' is too much
- The icons and words used are not clear for the user causing problems with navigating through the LEAVES application
- The first page of the LEAVES application first presents the option to log in information with an already existing account and then below, the option to register in LEAVES as new user

Some issues were more prominent in some countries. Dutch participants had specific problems with the way the prototype was translated from English to Dutch and with the terms and icons used to navigate through the LEAVES prototype. Also in Switzerland, participants struggled with the terms and icons used to navigate, like the word 'Admin'. Additionally, they had some problems navigating through the prototypes because of lack of clear 'back' buttons.

Regarding Sun, in Portugal and in the Netherlands, most participants did not know who the character was. In Switzerland, participants recall the character and knew what it was, but they did not understand its function or they could not relate to it.

Regarding willingness to pay, the answers received were mixed. Some participants in all three countries would like to use such a program, but, for instance, in Switzerland and in Portugal, they would expect the state to pay for it. In Switzerland, some participants said that if they need to pay for it, they would like to have a regular payment. In the Netherlands, participants said that the cost of LEAVES should depend on the financial situation of the user. Additionally, some prices were mentioned, like 10-20 euros per month or a maximum of 50 euros.

Finally, some positive comments about the LEAVES prototype were also given. In general, some participants thought that the onboarding, besides its length, was easy to navigate. Additionally, some participants liked the concepts which were explained in the module 'Fostering Positive Thoughts and Emotions'. Moreover, the diary to write notes in the exercise was considered useful.

5.9 Implications for technical development (recommendations)

Not all the 66 usability issues need to be taken into consideration for the technical development. However, from the critical issues and some serious issues, some recommendations are given:

- Make the onboarding shorter and solve the loop created because of the amount of information that the system wants to offer
- Give information about LEAVES at the beginning of the application to give an immediate clear idea about what LEAVES is
- In the first page of LEAVES, change the order between the option to register in LEAVES and the option to log in in LEAVES
- In the module 'Fostering Positive Thoughts and Emotions', use language which is easier to understand for users with a low educational level
- The terms and icons used to navigate through the LEAVES application should be understandable for users with low technological literacy
- For the Netherlands, make sure that the translation from English to Dutch is correct and fits the Dutch culture
- Create a clear progress line to let understand the user at which point of the onboarding or study module they are
- Put the explanation of the exercise at the beginning to clarify for the user what he or she needs to do

- Solve those issues which did not require that much technical and content work, like correcting the order of the answers for the second questionnaire in the onboarding or changing the format of the picture in the second lecture 'Emotion Regulation' of the module 'Fostering Positive Thoughts and Emotions'

Finally, a minor issue was that the privacy statement was presented more time during the onboarding, but only once it was 'mandatory' for the user to read it. Therefore, it is recommended to present the privacy statement only once at the beginning and to make it 'mandatory' for the user to accept in case they want to use the service.

6 Conclusion

This deliverable presents an overview of all the iterative evaluations that have been taken place. The usability testing have been performed in month 6th (low), 12th (mid), and 18th (high) of the LEAVES project. The results of this user research has been transferred to the service model team and to the technical team to enable them to adapt the product and the service. The results can be found in the Minimal Viable Product that has been developed as part of WP2 Technology development and that will be used for the WP2 Real Life Evaluation. The Deliverable D2.1.4 describes extensively the latest improvements of the product, most of which are a result of the recommendations described in this report.

6.1 Process

At the end of each usability testing, the issues, their relevance, and the recommendations were reported in form of a presentation to the technical development team and team responsible for the content. During these meetings, the technical development team was responsible to categorise the issues and estimate them. Based on the criticality of the user feedback and the efforts required, the teams could prioritise the issues and integrate the implementation in the agile development process. Again, more about the agile process and integration can be found in the deliverable D2.1.4.

The Figure 6 below, depicts a prioritisation of the features during a workshop with the end-user testing teams and the technical teams. The criticality (below, left to right) and the categories (colors) can be observed. The checkmarks mark issues who had been started or tackled by the teams already, where the cross mark issues which couldn't be tackled because of time, effort, or project framing constraints.

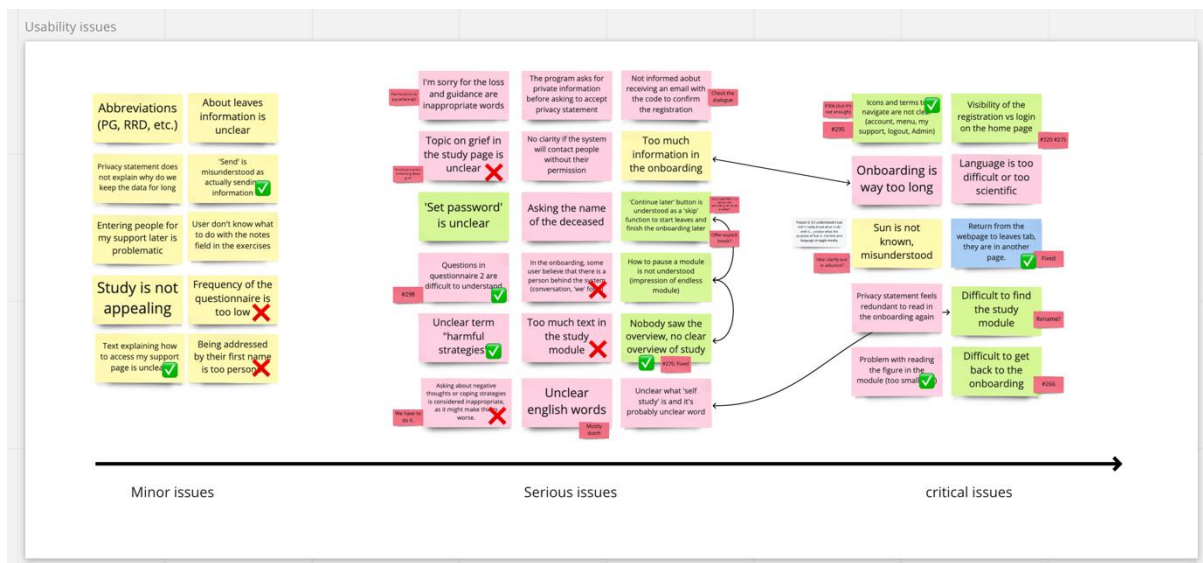


Figure 6: Miro board of usability issues M18

As last, the solutions for the issues to work on were elaborated and action points for the LEAVES team were assigned.

Finally, the information about willingness to pay was taken into consideration as developing the business model per each country in WP4.

7 Appendices

7.1 Appendix A: End-user testing protocol M6

Activity		Materials	Time
1	Welcome	Preparation: - Test the LEAVES website - Check the audio settings of your audio recorders and test them - Check whether you have all materials - Make sure there is someone to receive the participants - Coffee/tea	5
2	Explain the goal of the evaluation: Looking for first reactions from older adults on a service that is being developed for support mourners after loss of a spouse.		2
3	Obtaining informed consent + permission for audio recording	<ul style="list-style-type: none"> Informed consent form Pen 	2
	Turn on audio/video recorders	<ul style="list-style-type: none"> 2x Audio recorder (if you use 1, you will always see batteries run out, it doesn't record correctly) or an audio recorder and video recorder 	

4	Pre-study questions	<ul style="list-style-type: none"> - Age - Sex - Living situation (alone/together) - Laptop/smartphone ownership - Did you experience any large/impactful losses of persons near you? 	<ul style="list-style-type: none"> • Note block • Pen 	3
5	Introduce scenario (if applicable)		<ul style="list-style-type: none"> • Scenario 	3
6	Thinking aloud preparation: instructions and training		<ul style="list-style-type: none"> • Laptop or Tablet/iPad • Internet connection 	10
7	Let the participant interact with LEAVES. Ask the participant to think out loud while interacting with the technology. Let him/her interact with LEAVES until s/he reaches the section where Luisa asks for the end-user's name. Then stop the interaction.	<i>Make sure to observe the participant reaction and how they start using the computer. Are they comfortable? What are they looking for? Can they click or tap easily? Do they recognize intuitively what they have to do.</i>	<ul style="list-style-type: none"> • https://www.leaves-project.eu/demo 	5
8	Ask the following questions	<ul style="list-style-type: none"> -What do you think this website is? - What do you think you have to do? - Who do you think this person is? - Do you like talking to this person? 		3

9	Let the participant continue with Luisa while thinking aloud for the intake screens (name, sex, details on the loss). Then stop the interaction.	<i>Observe and also measure (time) how they interact with the keyboard and how they enter the information</i>		5
10	Ask the following question:	- The virtual agent asked you several questions, did you feel comfortable giving her this information? Why (not)?		2
11	Let the participant interact with the social circle module while thinking aloud. Make him/her stop after 10 minutes.			10
12	Closing interview	<ul style="list-style-type: none"> - What is your general impression? - Did you find anything particularly easy or difficult? - Do you trust the virtual agent and the things that she is telling you? Why (not)? - Who would you expect as a virtual agent? A peer as it now? Or someone different, like a psychologist or GP? Why? - Would you be interested in learning more about this service? - If so, where would you expect to 		5

		receive this information? Or where would you search for it?		
13	Closure			5
	Total			60 min.

Analyses

Demographics

Please report in counts.

Thinking aloud data

Listen to the audio recordings (in pairs if possible) and note down the positive and negative aspects of interacting with LEAVES. Also note down the participant's rationale for a comment (if given). Then, merge comments over all participants and include counts. Please note that transcribing the recordings in full is **NOT** necessary.

Open-ended questions

Please analyse on a per question basis. Per question, group similar answers and provide counts.

7.2 Appendix B: Scenario for participants who have not lost their spouse yet

[PLEASE USE THIS SCENARIO IF YOU ARE TESTING WITH AN OLDER ADULT THAT HAS NOT LOST HIS/HER SPOUSE]

Imagine that you are going to use the LEAVES service as Tom. Tom is a 74 year old man who recently lost his wife, Mary. Tom has difficulty with finding a new routine in life. Most of his social circle came through his wife. And now that she is gone, Tom does not receive many visitors, does not go out often and feels quite alone. Tom has a long-time best friend in Stephen, but Stephen does not know how to deal with Tom and his loss. As a result, they often sit together drinking coffee in silence. Tom is with his wife in thoughts, and Stephen does not dare to breach the subject. As a result, Stephen is also visiting less often. Tom is sad about this. He and Stephen used to laugh so much about the things they did together as kids. They also used to visit the matches of the local football club, but due to Corona this is not possible anymore. Tom cannot find an activity to replace this. This circumstance makes it even harder for him to maintain this relation that is so important to him. Tom wants to tell Stephen how much he means to him, but he does not know how. Basically, both Tom and Stephen want their relation to be as it used to be, but Tom's sadness makes it impossible to create the atmosphere that they used to create automatically when they were together.

Tom knows he has to find a new routine in life, but does not know where to start. It feels like such a daunting task!

Via somebody he knows, Tom stumbled upon LEAVES. LEAVES is a service that helps older adults who have lost their spouse to process their loss and restructure their lives.

7.3 Appendix C: End-user testing protocol M12

Scenario

Part 1

Monika, a woman of 72 years, has just lost her husband Jeremy, with whom she was married for 38 years. Jeremy passed away suddenly, and Monika has a hard time coping with the loss and adjusting to her new life. She sits at home, not really knowing what to do, just thinking about Jeremy and thinking how unfair everything has been. Sometimes she calls her friend Rana to talk about her feelings. Rana knows these feelings and asks Monika to try out LEAVES, a website she heard about on the news. Monika is eager to try something at this point, googles LEAVES, and starts using the service. When first using LEAVES, Monika is guided through a procedure to get her started. Monika follows the directions on the screens.

Part 2

Monika decides to take a look at the Study option. The study option provides a program to help Monika in processing her grief.

Part 3

Monika wants to know which information LEAVES is collecting about her. She decides to have a look at the privacy policies of LEAVES. The privacy policies contain explanations about which data is collected from her for which purpose.

Part 4

The version of the LEAVES that Monika has been using, recommended by her friend Rana, is a trial version, with limitations on usage options and time. Monika concludes that she would like to have access to the full version.

	Activity	Materials	Time
1	Welcome	Preparation: - Test the LEAVES prototype - Check the audio settings of your audio recorders and test them. In case of phone interviews: please use Skype calls and a Skype recording program - Check whether you have all materials	5

				<ul style="list-style-type: none"> - Make sure there is someone to receive the participants - Coffee/tea 	
2		Explain the goal of the evaluation: Looking how older adults react on the conceptual design of a service that is being developed to support mourners after loss of a spouse.			2
3		Obtaining informed consent + permission for audio recording		<ul style="list-style-type: none"> • Informed consent form • Pen 	2
		Turn on audio/video recorders		<ul style="list-style-type: none"> • 2x Audio recorder (if you use 1, you will always see batteries run out, it doesn't record correctly) or an audio recorder and video recorder 	
4		Pre-study questions	<ul style="list-style-type: none"> - Age - Sex - Living situation (alone/together) - Laptop/smartphone/tablet ownership - Did you experience any large/impactful losses of persons near you? - If so, who did you lose? How long ago was this? 	<ul style="list-style-type: none"> • Note block • Pen 	3
5		Thinking aloud instructions (for more information, see Appendix) - We will test the concept of a service which is intended to help elders who			5

		<p>have lost a spouse and having a hard time with it (explain what a prototype is and that it still looks very minimal and not everything works)</p> <ul style="list-style-type: none"> - To do so, we will give you scenarios with tasks. We would like you imagine that you are in the given scenario and try to solve the task. - We are evaluating our concept, we are NOT evaluating you, so you don't need to be afraid of giving a wrong answer - To better understand how well our concept is working, we would like you to think aloud while you are trying to solve the task. (Explain Thinking Aloud + do the practice task) 			
6		Introduce scenario part 1		Scenario	2
		Part 1: Onboarding & main functionalities			
7		Task: As Monica, try to get yourself started with Leaves, following the directions on the screen."	Let the participant click through the prototype screens for the onboarding while thinking aloud	Figma: Scenario 1	8
8		Questions after onboarding [screen 25]	<ul style="list-style-type: none"> - Who do you think 'Sun' is? - What do you think the purpose of this task was? - Would you feel comfortable, interacting with such a technology? 		5

			- Would you prefer to do this alone or with a friend?		
Part 2: Study section					
9		<p>Prototype</p> <p>Task: Please find out what the Study section is. Start your first study session to get an impression of how everything works.</p>	<p>When looking at the writing exercise screen, ask:</p> <ul style="list-style-type: none"> - What mode do you prefer to work in? Typing on the screen? Writing by hand? Speaking? Taking pictures? 	Figma: Scenario 2.1	5
10		<p>Prototype</p> <p>Task: Please explore the other Sections of LEAVES</p> <p>[Allow people to see one screen of each section to better grasp what they represent.</p> <p>Depending on the participants' capabilities and the setting, allow participants to explore themselves or guide them through the different sections]</p>		Figma: Scenario 2.2	6
11		<p>Questions</p>	<ul style="list-style-type: none"> - What can you do in LEAVES? - What do you think is especially useful? - What do you think is not so useful? 		5
Part 3: Privacy design					

12		Introduce scenario part 3			1
13		<p>Task: Please find out what data LEAVES is collecting about you</p> <p>[Guide participants to the Privacy statements</p> <p>About Leaves > Data protection and Privacy]</p>		Figma: Scenario 3	2
14		Questions	<ul style="list-style-type: none"> -What is your general impression of the privacy statements? -Which data do you think is collected from you? -Did you find any of the privacy statements concerning? If yes, why? - Do you feel comfortable with LEAVES collecting this information? 		5
		Part 4: Willingness to pay			
15		Introduce scenario part 4			1
15		Questions	<ul style="list-style-type: none"> -What do you think is the real adding value of LEAVES? -Having this in mind, how much would you be willing to pay for this service? - In your opinion, where would it be most suitable to 		5

			<p>find/buy this service? (some examples are: Health insurers, Funeral homes, Elderly associations, Health professionals)</p> <p>-How would you prefer to pay for LEAVES? Just a one time payment for unlimited use? Or via a subscription that you pay per week or month?</p>	
17		Closure		3
		Total		65 min.

7.4 Appendix D: Demographic data questionnaire

In this questionnaire, we ask you some questions about yourself.

1. With which gender do you identify yourself?

- Man
- Woman
- Other
- I would rather not say it

2. What is your age?

3. What is the highest level of education you have?

- Basis school
- Middle school
- Middle practical school
- High school
- Bachelor degree
- Master degree

5. Which one of the following devices do you use at home? You can tick more than one answer.

- Smartphone
- PC / laptop
- Tablet
- Smartwatch
- Game computer
- Others, namely:

7.5 Appendix E: Health Literacy Scale

This short questionnaire is about your experience with medical information. Please, tick the square which corresponds to your answer.

1. How often do you experience problems with the understanding of texts about your health or a sickness (Think, for example, about folders) ?

- Never
- Occasionally
- Sometimes
- Often
- Always

2. How confident do you feel when you need to fill in medical forms ?

- Not at all
- A little bit
- Somewhat
- Quite a bit
- Extremely

3. How often do you have someone help you with the reading of brochures, forms, or letters from the hospital, the pharmacy or your doctor ?

- Never
- Occasionally
- Sometimes
- Often

Always

7.6 Appendix F: End-user testing protocol M18

Scenario

Part 1

Monika, a woman of 72 years, has just lost her husband Jeremy, with whom she was married for 38 years. Jeremy passed away suddenly, and Monika has a hard time coping with the loss and adjusting to her new life. She sits at home, not really knowing what to do, just thinking about Jeremy and thinking how unfair everything has been. Sometimes she calls her friend Rana to talk about her feelings. Rana knows these feelings and asks Monika to try out LEAVES, a website she heard about on the news. Monika is eager to try something at this point, googles LEAVES, and starts using the service. When first using LEAVES, Monika is guided through a procedure to get her started. Monika follows the directions on the screens.

Part 2

Monika decides to take a look at the Study option. The study option provides a program to help Monika in processing her grief.

Activity		Materials	Time
1	Welcome	Preparation: - Test the LEAVES prototype - Check the audio settings of your audio recorders and test them. In case of phone interviews: please use Skype calls and a Skype recording program - Check whether you have all materials - Make sure there is someone to receive the participants - Coffee/tea	5
2	Explain the goal of the evaluation: Looking how older adults react on the conceptual design of a service that is being developed to support mourners after loss of a spouse.		2
3	Obtaining informed consent + permission for audio recording	<ul style="list-style-type: none"> • Informed consent form • Pen 	2

	Turn on audio/video recorders	I will now turn on the audio (and video) recorder.	<ul style="list-style-type: none"> • 2x Audio recorder (if you use 1, you will always see batteries run out, it doesn't record correctly) or an audio recorder and video recorder 	
4	Pre-study questions	<ul style="list-style-type: none"> - Could you please fill in this questionnaire? -> Demographics (Appendix 2) - Could you please fill in this questionnaire? -> Health literacy scale (Appendix 3) 	<ul style="list-style-type: none"> • Note block • Pen • Demographics questionnaire (Appendix 2) • Health literacy scale (Appendix 3) 	3
5	<p>Thinking aloud instructions (for more information, see Appendix 1)</p> <ul style="list-style-type: none"> - We will test the LEAVES service which is intended to help elders who have lost a spouse and having a hard time with it (explain that it is the minimal viable product, that all functionality is there, but not all content) - To do so, we will give you scenarios with tasks. We would like you imagine that you are in the given scenario and try to solve the task. - We are evaluating the service, we are NOT evaluating you, so you don't need to be afraid of giving a wrong answer - To better understand how well our service is working, we would like you to think aloud while you are trying to solve the task. This entails saying what you are thinking and doing, and what you are seeing on the screen while performing the task. For example, what are your doubts? As you are silence for more than 5 seconds, I will remind you to think out loud. (Explain Thinking Aloud) 			5
6	Introduce scenario part 1 (look above)		Scenario 1	2

Part 1: Onboarding				
7	<p>Task 1: As Monica, get yourself started with Leaves, following the directions on the screen to finish the onboarding.</p>	<p>Let the participant click through the LEAVES service for the onboarding while thinking aloud.</p> <p>Participants can decide how to go through the onboarding (for instance, by looking at the explanation of LEAVES or by skipping them, or by reading about their privacy or by skipping that).</p> <p>Let them read as much as possible but, if needed, with some guidance.</p> <p>They will also go through two questionnaires. Remind participants that it does not matter what they fill in and they are not being tested.</p> <p>Once they need to log in, give the following information:</p> <p>Code: DEMO</p> <p>Email:</p> <p>Password:</p>	<p>LEAVES service: https://www.aalleaves.eu/en/login</p> <p>Note block + pen + stopwatch/timer</p> <p>A document with a fake email and password per participant.</p> <p>Also, if the researcher has face-to-face sessions and uses the same computer, she or he should cancel the cookies. If not, it is not possible to go through the onboarding again and participants will start from the point that the previous participant stopped at.</p>	15

		<p>Measure the time during the task. In case the participant has some difficulty, guide him/her to the next step. Do not exceed 15 minutes.</p> <p>(Task completion: finishing the onboarding which is after the explanation of what a module is -> when the home page appears)</p>		
8	Questions after onboarding	<p>- Who do you think 'Sun' is?</p> <p>-Is there something that you would like to say or to add regarding the part of the prototype you just saw?</p>		5
9	Let the participant fill in the three-item After Scenario Questionnaire to measure task satisfaction.		ASQ (see appendix G)	2
Introduce scenario part 2 (look above)				
Part 2: Study module				
10	Task 2: Please, click on the study module and start your first study session.	<p>Let the participant click through the LEAVES service for the study module while thinking aloud.</p> <p>Pay attention whether they can find the study module from the homepage. If not,</p>	<p>Homepage of the LEAVES service</p> <p>Note block + pen + stopwatch/timer</p>	3

		<p>help them after 1 minute, or if they ask for help.</p> <p>(Remember that it is possible to only work on one module.)</p>		
11	Let the participant fill in the three-item After Scenario Questionnaire to measure task satisfaction.		ASQ (see appendix G)	
12	Task 3: Get an impression of how everything works, and work with it for around 10 minutes.	<p>Once they start the study module, they will be reading some explanation regarding 'Fostering Positive Thoughts and Emotions'.</p> <p>Let them read as much as possible but, if needed, with some guidance.</p> <p>Afterwards, they will read about an exercise they can do to find helpful strategies according to the situation they encounter.</p> <p>Task completion: Questionnaire to rate the study module. If they still have time they can go on. This task should not last more than 15 minutes</p>		12
13	Questions	- In your opinion, what is the purpose of the study section and its modules?		3

		<p>- What did you think about the information about processing your feelings that you just read? Was the text understandable, and did you find it pleasant and easy to read?</p> <p>-Is there something that you would like to say or to add regarding the part of the prototype you just saw?</p>		
14	Let the participant fill in the three-item After Scenario Questionnaire to measure task satisfaction.		ASQ (see appendix G)	2
Part 3: Filling in questionnaires				
15	Introduce the SUS and HUBBI questionnaires			1
16	Let the participant fill in the questionnaires		SUS and HUBBI (Appendix H and I)	5
17	Discuss participants acceptance of technology	<ul style="list-style-type: none"> - Suppose you were in Monika's situation, would you consider using LEAVES? Why (not)? - How much would you be willing to pay for a service like LEAVES? Why? 		3

18	Closure			2
	Total			72 min.

7.7 Appendix G: After Scenario Questionnaire (ASQ)

1. Overall, I am satisfied with the ease of completing the tasks in this scenario.
 - Strongly disagree
 - Disagree
 - Somewhat disagree
 - Neutral
 - Somewhat agree
 - Agree
 - Strongly agree
2. Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.
 - Strongly disagree
 - Disagree
 - Somewhat disagree
 - Neutral
 - Somewhat agree
 - Agree
 - Strongly agree
3. Overall, I am satisfied with the support information (online-line help, messages, documentation) when completing the tasks.
 - Strongly disagree
 - Disagree
 - Somewhat disagree
 - Neutral
 - Somewhat agree
 - Agree
 - Strongly agree

7.8 Appendix H: System Usability Scale (SUS)

1. I think that I would like to use LEAVES frequently
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
2. I found the system unnecessarily complex
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
3. I thought the system was easy to use
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
4. I think that I would need the support of a technical person to be able to use this system
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
5. I found the various functions in this system were well integrated
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
6. I thought there was too much inconsistency in this system
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
7. I would imagine that most people would learn to use this system very quickly
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
8. I found the system very cumbersome to use
 - Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
9. I felt very confident using the system
 - Strongly disagree

- Disagree
- Neutral
- Agree
- Strongly agree

10. I needed to learn a lot of things before I could get going with this system

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

7.9 Appendix I: eHealth Usability Benchmarking Instrument (HUBBI)

Say to which extent you agree with each statement by ticking one of the boxes.

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

1. I experienced system errors during the use of LEAVES

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

2. I got stuck whilst using LEAVES

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

3. LEAVES is suitable to be used at home

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

4. LEAVES is suitable for me

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

5. LEAVES is useful to help elderly people to process the loss of their spouse.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

6. Everything in LEAVES is clear to me (for example: the home page, which buttons to push, where I need to fill in things etc.)

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

7. The signals, warnings and instructions in LEAVES are easy to interpret (for example: warnings if I did not do something

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

correctly, or instructions on how to go on with the study modules)	
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8. The lay-out of each page of LEAVES is attractive					
	1	2	3	4	5

9. The messages in LEAVES are structured in a good way					
	1	2	3	4	5

10. I know where in LEAVES I can find the information that I need					
	1	2	3	4	5

11. I understand the connection among the different parts of LEAVES					
	1	2	3	4	5

12. The information about LEAVES is easy to understand					
	1	2	3	4	5

13. LEAVES gives clear explanation about difficult topics which can help me to process my grief					
	1	2	3	4	5

14. The error messages in LEAVES clearly tell me how I can solve problems					
	1	2	3	4	5

15. LEAVES sufficiently explains how system procedures should be performed, such as creating an account, logging in, changing of setting					
	1	2	3	4	5

16. LEAVES provides enough feedback to support me in managing my health

1	2	3	4	5

17. Overall, I am satisfied with LEAVES

1	2	3	4	5

18. I like how LEAVES contributes to my health

1	2	3	4	5

7.10 Appendix J: Usability issues list

Critical issues	NL	CH	PT
1. The registration for new users' option is not clearly visible on the homepage	x	x	
2. The onboarding process of the LEAVES application is considered too long and elaborate for the user	x	x	x
3. The LEAVES application uses words and sentences that are too difficult or scientific for the user	x	x	x
4. There is too much text in the module 'positive thoughts and emotions' for the user to go through	x	x	
5. The user could not find the self-study module in the LEAVES application	x		
6. The user does not know how to go back to the onboarding process from the Admin section.		x	
Serious issues	NL	CH	PT
1. The LEAVES application provides the user insufficient information about the program	x	x	x
2. When the user goes to the project website and wants to return to the LEAVES application by clicking on the LEAVES tab in the internet browser, the user is redirected to a different page than the one he or she was previously on.	x		
3. The LEAVES application asks for personal information before the user agrees to set up an account and accepts the privacy statement	x	x	
4. The user is not informed by the LEAVES application that after creating an account they will receive a code in their mail inbox to confirm their registration.	x		
5. The sentence 'I'm sorry for the loss of your partner' is considered inappropriate by the user to say a user of the LEAVES application	x		
6. The user does not know what to do with the notes field in the exercise section of the module 'positive thoughts and emotions'	x	x	
7. The LEAVES application contains words and text that are not translated to the user's native language	x	x	
8. The questions in questionnaire 2 are difficult to interpret for the user	x		
9. The user does not understand the meaning of the button 'set password'	x		
10. The LEAVES application uses words and icons that are unclear for people with low digital literacy	x	x	
11. The LEAVES application discusses strategies to cope with grieving but does not explain this well to the user	x	x	
12. The LEAVES application asks questions on negative thoughts or coping strategies which are considered as inappropriate to the user as it can lead to more negative thoughts to people who are grieving	x		

13. The module 'positive thoughts and emotions' focuses too much on negative thoughts or coping strategies according to the user		x	
14. The text on how to access the 'my support list' is unclear to the user	x		
15. The LEAVES application is considered as not personal enough to support the user in his or her grieving process		x	
16. The user cannot find the Admin section in part 2 of the onboarding process		x	
17. In the first step of the onboarding, the user is sent back to the second page instead of the first page of LEAVES after indicating that he or she is not grieving.		x	
18. The character 'Sun' is not clearly visible in the LEAVES application		x	
19. The user does not understand the character 'Sun' in the LEAVES application		x	x
20. The questions in the module 'Fostering Positive Thoughts and Emotions' do not have a gradual learning curve, which makes the module too intense for the user		x	
21. Loop before the baseline assessment in part 5 for "My Support". If the user wants to get all the background information available, there is always an option to know more about the "why". The content repeats itself at some point but the option keeps returning, it's never "settled".		x	
22. The user believes that the questions asked in the exercise page of the study module 'Fostering Positive Thoughts and Emotions' are too generic		x	
23. The 'my support' button in the header does not show on the screen when the LEAVES application explains about it in the onboarding process		x	
24. The exercise page in the module 'Positive thoughts and emotions' is unclear as there is a long introductory text before explaining the exercises the user has to do		x	
25. The error message on the log-in page when the user uses the 'already user' option instead of the 'registration for new users' option' does not help the user to understand what he or she did wrong		x	
26. The user believes that the LEAVES application does not provide enough interaction.			x
Minor issues	NL	CH	PT
1. On the page 'about the program' there are two rows of option buttons, which cause confusion for the user.	x		
2. The user misinterprets the button 'Continue later' as skipping option instead of a 'pause' option (to continue later with the onboarding).	x		
3. In the onboarding process there are words like 'conversations' and 'we' which incorrect expectations about how the system will support the user (that there is a person behind the system)	x		
4. The LEAVES application uses abbreviations that are not explained to the user	x		

5. The word 'guidance' is considered inappropriate by the user to say a user of the LEAVES application	x		
6. The user does not like it that the LEAVES application asks the user about the name of the deceased partner	x		
7. After reading the privacy statement the first time, reading the privacy statement a second time during the onboarding process feels redundant for the user	x		
8. If the user does not want to enter people to the system who may support him or her outside the program, then the system's answer 'Good, you can also answer these questions later' causes confusion with user as he or she does not understand which questions the system refers to.	x		
9. The self-study page does not clearly indicate which modules are available to the user.	x	x	
10. The user does not understand how to pause a module.	x		
11. The self-study page is not appealing to the user	x		
12. The user believes that the frequency of questionnaire 2 is too low.	x		
13. The user cannot relate to the explanation on 'Grief' as it is presented on the self-study page.	x		
14. The user believes that the term 'self- study' is not suitable for the intended user group of the system	x		
15. The user believes that being addressed by the system by her first name is too personal	x		
16. The user does not understand the meaning of the button 'Send'	x	x	
17. The privacy regulation statement does not clearly explain to the user how the data is stored, shared and handled by other parties.	x	x	
18. The LEAVES application does not clearly explain how it will contact with people to support her without her permission	x		
19. The LEAVES application should more clearly state which personal information of the people on the support list is necessary		x	
20. The text on difficult situations on module 'Fostering Positive Thoughts and Emotions' is unclear to the user as it does not explain what is meant with difficult situations.	x		
21. In the introduction to step 5 (My Support) it is unclear what is expected in terms of "having a plan on how to handle intense emotions"		x	
22. The LEAVES application is inconsistent in using a formal or informal tone-of-voice with the user		x	
23. The phrase 'well done' in the dialogue after the exercise page in the study module 'Fostering Positive Thoughts and Emotions' is unclear to the user as it does not explain what the user has done well so far		x	
24. The user mistakes the introduction to the privacy statement for the full privacy statement that can be accessed via the button 'privacy statement'		x	

25. The user thinks the word 'Admin' is not suitable for a profile page of the system's user		x	
26. The user does not notice the progress bar on the bottom of the screen during the onboarding process		x	
27. The user does not know how to go back of one step within a module		x	
28. The text in the picture in the lecture about 'Emotion Regulation' is not big enough		x	x
29. The user cannot find the log-out function in the LEAVES application		x	
30. The user does not like the word 'strategies' in the context of grieving and coping with grief		x	
31. The reading about grief in the onboarding is too long for the user causing confusion.			x
32. The text size in the LEAVES application is too small			x
33. The answers to the questionnaire 2 are not in the correct order, precisely 'many or most of the days' should go after 'half of the days' and not before.			x
34. The aesthetics of the onboarding is not that attractive			x

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