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MICHEL BAUER

DEFINING DIGITAL JOY-OF-USE CRITERIA FOR SENIORS

A Design Approach to Build Motivational User Experiences for Older Generation

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Projeto apresentado ao IADE – Universidade Europeia, para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Design de Interação realizada sob a orientação científica do Professor Doutor Carlos Rosa do IADE – Faculdade de Design Tecnologia e Comunicação da Universidade Europeia e Professor Doutor Bruno Silva, do IADE – Faculdade de Design Tecnologia e Comunicação da Universidade Europeia e do Instituto de Telecomunicações, Lab NetGNA, Universidade da Beira Interior.

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keywords Joy-of-Use, Ageing Society, User Experience Inclusive Design

abstract

The recent increase of aging population across Europe and the rest of the globe represents one of the most radical demographic changes in the history of humankind. The increase of ageing society will have a vast effect on governments, families, individuals and companies, humans getting older has deeply modified societies, making it possible that three or more generations live together within the same environment. Due to digital environments, it is important that the needs of older generations are adequately taken into account when it comes to modern communication. In recent years, there has been a lot of research on necessary usability standards within website development for the aged generation, however a functioning usability is not the only point to consider for a successful realization of a digital product. Therefore, the objective of this thesis is to identify which criteria in terms of Joy-of-Use can help to motivate older people to use digital applications. The results should contribute to provide additional recommendations for the development of the project "Never-too-old".

The underlying research in this thesis is divided in two parts, in the first part experts in the field of ageing society have been interviewed, to get a better understanding and validate the findings within the literature review. In the second part of the study, people over the age of 60 years have been interviewed, to understand which criteria of Joy-of-Use motivates them to use digital applications. The results show that especially the criteria stimulation of the intellect, identification with the product and arousal of curiosity play an important role within the analyzed target group.

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INTRODUCTION

In a study conducted by the Nielsen and Norman Group and written by Kane (2019), older people were surveyed about their perception of digital content. The researchers found that seniors often feel that websites and apps are not designed with consideration for their needs and interests. One senior participant said that he felt left out of the online world because it was created with someone very different in mind, another senior observed:

"You look at things that are on the internet and it's skewed towards not my demographic. The younger people, this is their medium. People my age did not grow up with it. People my age are not in charge of it." (Kane, 2019)

This view is certainly a bit radical, nevertheless older generations are often not sufficiently considered when creating digital applications. Literature on web design for the elders is heavily focused on readability and simple usability. In fact, a simple and ergonomically considered usability is especially relevant when developing for seniors, however other aspects of a qualitative user experience should not be ignored. The focus of this thesis is Joy-of-Use; therefore, it will be researched how Joy-of-Use can be achieved when older people use digital applications.

Never-too-old is a web application, accompanying this work and providing the elderly a platform through which they can promote and offer workshops. This gives them the opportunity to connect with younger people and pass on their knowledge gained throughout their lives. In addition, there is a marketplace within the application, where older people can sell their own handcrafted products. Within this thesis older people are referred to as the primary user group of the application Never-too-Old. The project should serve as a practical research reference for the thesis, in chapter 6 the application is described in more depth.

Problem description

Many people experience loneliness and depression in old age, either as a result of living alone or due to lack of close family ties and reduced connections with their culture of origin (Singh & Misra, 2009). A study carried out by the industrial psychiatry journal, proves a significant correlation between depression and loneliness. Especially as the intergenerational exchange in everyday life became very rare, a huge part of today's human communication is based on digitalization. In particular the interaction between younger and older generations suffers from it and also leads to an extinction of cultural knowledge. (Singh & Misra, 2009)

However not everyone in the elderly age group understands digital tools and how to work with them. In fact, elderly people are often seen as a homogenous group, concerning digital understanding. (Kane,2019) Often, the perception of software or a product is very contextual or person dependent. When researching the topic of “interactions between elderly people and digital elements”, it is obvious, that the central focus relates mostly to usability and readability. The objective is primarily on ensuring a most simple and understandable operation of an application. The main objective is to ensure a most simple and understandable operation of an application, unfortunately Joy-of-Use elements have rarely been found. One reason could be that developers of such applications suspect that this could be too much of a challenge for the elderly user, not knowing that challenges and stimulation in particular can be motivational factors when using applications. This work is intended to offer recommendations for action, to support the development of applications aimed at older target groups. In addition to the theoretical findings, direct actions will be described that can be included in the development of the project “Never-too-old”. The present study aims to answer the following questions:

Q1) Which criteria for achieving Joy-of-Use must be considered when developing digital applications for older people?

Q2) Which recommendations for action can be given for the project “Never-too-old” with consideration to Joy-of-Use?

Theoretical framework

The questions mentioned in the previous chapter shall be obtained by the following approach. The work is divided into a theoretical and an empirical part. At the beginning of the theoretical part the primary user group of the underlying project is described. The existing gap between old and young as well as the status quo of older generations within the digital environment will therefore be explained. Subsequently, the different perspectives on the term Joy-of-Use are analyzed and summarized. The theoretical part of the work is completed with a research and final overview of the usability standards to be considered when developing for older people.

In order to practically transport these findings into the project “Never-too-old”, the theoretical insights gained are analyzed in the empirical part of the work. The research design

for this thesis is divided into two parts. In the first part experts in the field of Aging-Society has been interviewed. The interviews serve to verify the findings of the literature research and to gain further recommendations of action. Following this, the target group to be tested is defined more precisely and interviewed using a mix of different user testing methods. After evaluation of the results, recommendations for action regarding relevant Joy-of-Use criteria for older target groups will be explained.

Contributions

The major findings of this work were presented at the International Conference Human Computer Interaction 2020, after the acceptance of the scientific paper: Michel Bauer, Bruno M.C. Silva, Carlos Rosa, "Defining Digital Joy-of-Use Criteria for Seniors: An Applied Design Approach to Build Motivational User Experiences for Older Generations", in International Conference Human Computer Interaction 2020 (HCII 2020), held virtually, 19-24 July. (proceedings in press).

CHAPTER 1 - BACKGROUND

1.1 AGEING SOCIETY

The recent increase of aging population across Europe and the rest of the globe represents one of the most radical demographic changes in the history of humankind. The increase in ageing society will have a huge effect for governments, families, individuals or companies. Many seniors experience loneliness and depression in old age, either as a result of living alone or due to lack of close family ties and reduced connections with their culture of origin or simply boredom. (Singh & Misra, 2009)

According to the ageing report of the European commission, the total population in the EU is projected to increase from 511 million in 2016 to 520 million in 2070. However, the working-age population (people aged between 15 and 64) will decrease significantly from 333 million in 2016 to 292 million in 2070. These projected changes in the population structure reflect assumptions on fertility rates, life expectancy and migration flows. The old-age dependency ratio of people aged 65 and above relative to those aged 15 to 64, in the EU is projected to increase from 29.6% in 2016 to 51.2% in 2070. This implies that the EU would go from having 3.3 working-age people for every person aged over 65 years to only two working-age persons. (2019)

The report further states that the fiscal impact of ageing is projected to be a significant challenge in almost all member states, with effects already becoming apparent over the course of the next two decades. Alone within the European Union the total cost of ageing which includes for example public spending on pensions, health care, long-term care, education or unemployment benefits, is expected to increase by 1.7 percentage points to 26.7% between 2016 and 2070. (2019)

If you look at these numbers, it becomes clear that digital content will have to be tailored even more to these user groups in the future. In this thesis, the central focus is on generating motivators to increase the Joy-of-Use for elderly people in obtaining digital applications. The most important terminology to understand the thesis will be described in the following.

1.1.1 GAP OF INTERACTION BETWEEN OLD AND YOUNG

Haegestad and Uhlenberg (2005) refer to a US social survey conducted in 1985, which was focusing on the lack of interaction between old and young found out that only 3% of young adults' non-related discussion partners were over the age of 53. Haegestad and Uhlenberg (2005) further describe, that this lack of interaction between generations strengthens the understanding of difference, that the other group is "not like us". The differences between being related and non-related seems to illustrate that the lack of interaction is not the result of unwillingness to interaction, but more likely from a lack of opportunity. This lack of interaction reduces the ability to become familiar with the other group and results in the creation of barriers. (Hagestad & Uhlenberg, 2005)

In the last few decades the life expectancy in the European Union rose from 69.29 years in 1960 to 80.99 years in 2017 (2018). The fact of humans getting older has deeply modified societies, making it possible that three or more generations live together within the same environment. Even though this development can be viewed as a great achievement, it does not mean that societies have changed their point of view on older generations. This holds particularly true for younger generations, as they, for example, often view older persons as conservative, angry and pessimistic. (Ayalon & Tesch-Römer, 2018)

Past research has discovered that emotional bonds promoted by personal interaction are significantly related to a decrease of ageist stereotypes. (Jost et al., 2004) Unfortunately, as described above, intergenerational interaction outside of family or work context is rare. It is very unusual that younger and older persons have deeper conversations or share freetime activities. (Hagestad & Uhlenberg, 2005) Furthermore, there is a hypothesis that rapid digitalization drives the conflict between the generations. In a study of Mark Prensky (2013) older generations are described as digital immigrants. Prensky describes that elderly people were socialized differently than their kids and are now in the process of learning a new language. He further says, that digital immigrants have to adapt to a new environment, which makes it sometimes hard for them to communicate with the digital natives. (Prensky et al., 2013)

However, there are also counterexamples that show that integration into digitalization can be created intergenerationally. Estonia is a good example of how digitization can work across all layers of the population. In Estonia 99 percent of all bank transfers are issued online, election and medical documentation is done electronically. Due to the enormous presence of digitization in everyday life, especially Estonia should feel the conflict of the generations

through digitalization. However, only 29.9 percent of Estonians believe that digitalization divides generations. (Hartleb, 2018) The “digital socialization” in Estonia shows that the argument elderly would be left behind by the digital transformation is not very plausible. The example of Estonia shows how digital solutions can be provided throughout all generations. With the support of digital elements, older generations can be better integrated into processes and structures of everyday social life.

In this thesis and the underlying project, a user-friendly concept with regard to older generations shall be developed. The focus of the work refers in particular to potential criteria and factors for increasing Joy-of-Use. In the next chapter, the necessary terms for understanding this thesis will be explained.

1.2. FUNDAMENTALS OF USER-EXPERIENCE DESIGN

In 2007 Donald Norman created the term because, in his view, the 'Human Interface' and 'Usability' were too narrow and he aspired to encompass all aspects of user experience with the product or system. Since then, there are a lot of different definitions of the term of user experience. Ross Unger is describing the term in his book “a project guide to UX design” as followed. “The creation and synchronization of the elements, that affect the user´s experience with a particular company, with the intent of influencing their perceptions and behavior. These things include the things a user can touch, such as tangible products and packaging, hear (commercials and audio signature) and even smell.” (Unger & Chandler, 2009)

In DIN EN ISO 9241-210 the term is described as a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service.

1.2.1. DEFINING USABILITY

After ISO 9241, the term usability describes the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments.

- Effectiveness is described as the accuracy and completeness with which specified users can achieve specified goals in particular environments.
- Efficiency is described as the resources expended in relation to the accuracy and completeness of goals achieved.
- Satisfaction is described as the comfort and acceptability of the work system to its users and other people affected by its use.

1.3. FUNDAMENTALS OF JOY-OF-USE

In order to design for Joy-of-Use, it is necessary to understand how it can arise and to which degree digital products can provide a joyful user experience. For this purpose, it should first be defined how joy and its origin can be explained. Subsequently, the term Joy-of-Use will be explained in more detail and known criteria for increasing Joy-of-Use will be described.

1.3.1 DEFINITION OF JOY

Many philosophers and psychologists have dealt with this topic over time. Jean-Paul Sartre and Siegmund Freud, for example, devoted themselves to the description and investigation of its´ origin. (Sartre, 1943) The results are numerous publications and theories that differ in the interpretation of their psychological and social meaning. One of the most recognized definitions is described by Ernest G. Schachtel (1959), who was inspired by Freud. According to Schachtel there are two types of joy. The first type he calls magical joy. This represents an experience based on the satisfaction of instinct and desire. During this short-lived experience, the individual experiences a momentary satisfaction that changes in a single moment. There seems to be something unreal in this momentary experience, because one single event changes the whole attitude. (Schachtel, 1959)

The second type of joy that Schachtel distinguishes is the real joy. Real joy can be associated with an activity in which the individual is in contact with its environment. It can occur when a child plays with a toy for example. Real joy differs from the first point in that it is based on an activity that is taking place in the reality of the moment. This type of joy tends to make social contacts and interactions easier. (Schachtel, 1959)

Often joy and fun are seen as the same thing, but it is important to distinguish between these two terms. Hassenzahl (2003) distinguishes between joy and fun by associating joy with the degree of "being absorbed" in a task or activity, whereas fun has more to do with distraction and diversion. Fun is the absence of seriousness. (Hassenzahl et al., 2003)

The next section describes which factors are necessary to achieve joy within the use of digital applications.

1.3.2 JOY-OF-USE

Völkel (2016) describes Joy-of-Use as a positive emotional reaction that arises within the overall impression of the interaction between a human and a software. The user is not rationally aware of it but experiences a certain emotional satisfaction during the usage. Aesthetic factors play an essential role in how the user experience a product or website positively. Despite the importance of aesthetics, the goal of Joy-of-Use is not to create something objectively beautiful. Rather, the point is that the functions of a website or application should work without problems and thus enable the user to experience success. That is why Joy-of-Use is an extension of usability: it adds the factors of aesthetics and emotions to this concept. However, the fact is, that the perception of a software or a product is very contextual or person dependent. Certain elements can increase the likelihood that users will have a positive experience with the product.

Völkel further states that it is important to take Joy-of-Use into account, since the appreciation of users is the key success of websites and application. Optimal usability ensures that the application is consistently developed in a user-oriented manner. Because of the positive emotional experience, Joy-of-Use is then used as an image-effective factor, which creates a competitive advantage. If a website manages to give a user a sense of motivation through appealing aesthetics, a clear structure of content and functional features, they will probably feel encouraged to return to the website or continue to use the product. Völkel describes that only with the combination of aesthetics, content and function, Joy-of-Use can evolve. He illustrate his definition of Joy-of-Use in the following illustration. (Völkel, 2016)

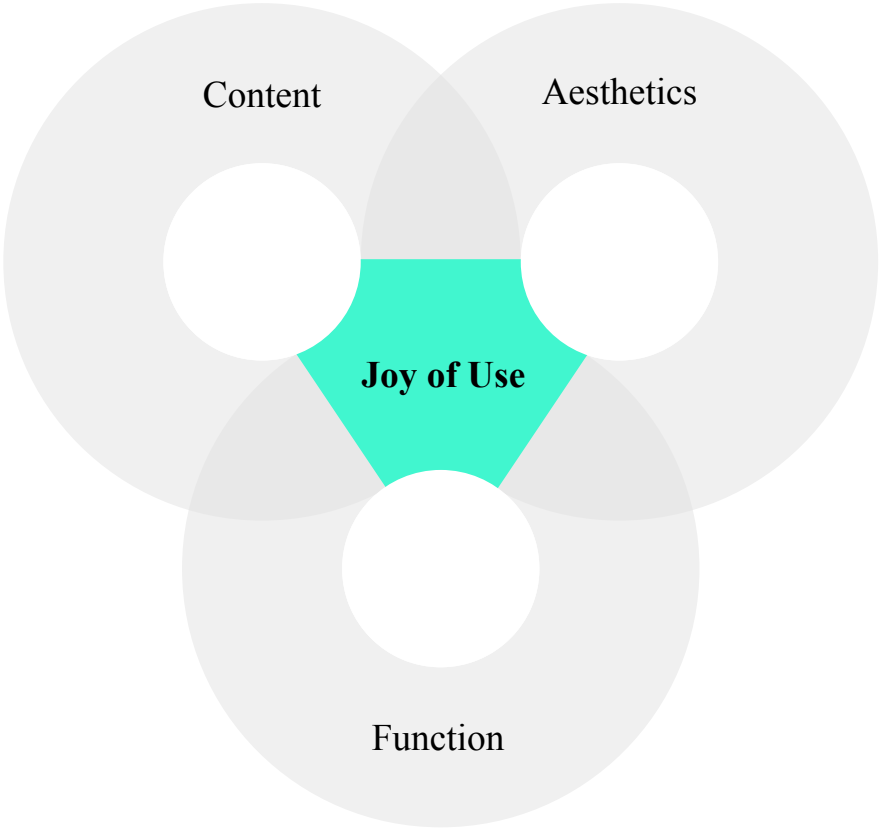

Fig. 1 Joy-of-Use according to Völkel (Völkel, 2016)

1.3.3 JOY-OF-USE ACCORDING TO JORDAN

According to Jordan (2002), users are no longer happily surprised when a product is simple to use but are at most unpleasantly surprised when it is difficult to use. Jordan sees usability as more than a problem-solving discipline and favors a more holistic usability approach, a so-called pleasure-based approach, in which the products offer more than usability. This is intended to increase the market value of a product positively. Jordan describes that it is important to define all the essential factors, that need to be fulfilled before thinking about creating pleasure or Joy-of-Use.

Within his book “Designing Pleasurable Products” Jordan describes that unlimited usability and utility is required for a Joy-of-Use. (Jordan, 2002) With his "Hierarchy of Consumer Needs", the functionality, also known as utility, must first be fulfilled, followed by usability and finally "pleasure" can be achieved. To visualize that thought, Jordan developed a

diagram, similar to Maslow´s pyramid of needs. (Maslow, 1943) As with Maslow, the need for a higher level only arises when the underlying need is satisfied. This thesis supports the idea of Jordan (2002) that especially with older people a certain quality of usability is necessary to create Joy-of-Use. Therefore, it is necessary to also describe the necessary usability actions to create a user-friendly application for the respective target group. However, before this term can be analyzed in more detail, the generally known criteria for achieving Joy-of-Use must be described.

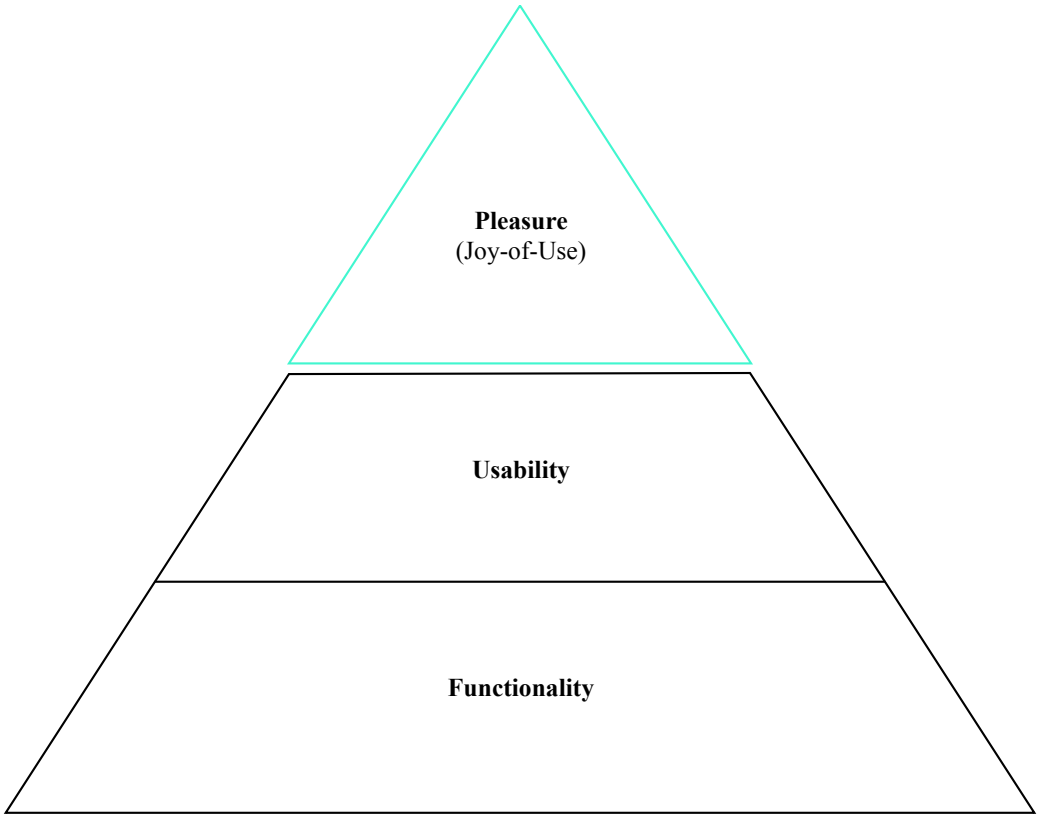

Fig. 2 Pyramid of pleasure (Jordan, 2002)

1.4 QUALITY CRITERIA OF JOY-OF-USE

After having defined the term Joy-of-Use, it is necessary to research which components or criteria increase the joy-factor of products. In the following section, different findings of existing literature on the subject will therefore be analyzed. Following the investigation of existing literature, the most relevant quality criteria will be summarized. This summary is to be

incorporated into the research design of this thesis in order to integrate Joy-of-Use in the practical part of the work and consequently measure it.

1.4.1 THE FLOW CONCEPT ACCORDING TO CSIKSZENTMIHALYI

Simplified, Joy-of-Use can be seen as a form of happiness or satisfaction that the user experiences when interacting with a product (Völkel, 2016). The theoretical background for human "happiness" describes Csikszentmihalyi (2003) in his flow concept. With flow, Csikszentmihalyi describes the optimal experience, a state in which the information entering the mind matches the goals. In order to get into the state of the flow, one has to fully commit oneself to an activity and the requirement has to take full concentration. However, it must not be so high that you are overstrained. The flow experience is limited by the two factors minimum requirement and requirement limit. Entering the phase of flow creates a forgetfulness and a state of joy. Within his theory he furthermore describes eight characteristics of flow:

- Complete concentration on the task
- Clarity of goals and reward in mind and immediate feedback
- Transformation of time (speeding up/slowing down)
- The experience is intrinsically rewarding
- Effortlessness and ease
- There is a balance between challenge and skills
- Actions and awareness are merged, losing self-conscious rumination
- There is a feeling of control over the task (Csikszentmihalyi, 2003)

1.4.2 TYPES OF PLEASURE ACCORDING TO TIGER

To understand how to create fun and joyful products, Lionel Tiger, a professor from Rutgers University in New Jersey US, differentiates between four different types of pleasure. According to Tiger, this framework model should serve as a supporting element of structuring ideas in the product design process. (Tiger, 2000)

Physio-pleasure

Physio-pleasure describes the pleasure experienced through the sensory organs. Sensory stimulation is absorbed by the sense of touch, taste and smell and is expressed in products. Furthermore, it is also influenced by a products effectiveness to perform an action.

Socio-pleasure

This type of pleasure arises on the one hand from the relationship with other people, on the other hand from the relationship of a person to the whole society in terms of status and image. Digital products often enable social interaction by giving people the opportunity to comment.

Psycho-pleasure

Psycho-pleasures are pleasures that refer to knowledge, information, discovery or other elements that satisfy the intellect. It can be seen as a positively challenging pleasure but also create negative emotions by constituting an illogical usability which confuses the user.

Ideo-pleasure

In the context of products, Ideo-pleasure extends to the aesthetics of a product or the values it embodies, such as responsibility to the environment when a product is made from organic materials. (Tiger, 2000)

1.4.3 QUALITY CRITERIA OF JOY-OF-USE ACCORDING TO BRANDTZAEG

In their key message, Brandtzæg et al. describe joy as the main motivation to drive all further interactions with an application. They define joy as a subjective experience that is related to personal motivation. Motivation can in turn arise in two ways. Firstly, in the form of the so-called extrinsic motivation, which depends on the result of the work. The theory of extrinsic motivation corresponds to the idea of using technology as a tool for a specific outcome. If, on the other hand, motivation arises in the form of intrinsic motivation, the usage is a reward in itself. According to Brandtzæg et al. it is necessary to consider both reasons for motivation when defining Joy-of-Use. Brandtzæg et al. recommend considering the following aspects when designing positive experiences for websites:

Challenges

Fun and satisfaction are often only felt, when a certain degree of challenge is required. Such a positive experience can only arise when challenges are adapted to individual skills.

Social interaction

Modern technology should enable communication and collaboration. This form of social interaction is a motivating factor and follows the need to exchange and share experiences with others. There should also be opportunities for competition and collaboration, as these motivate the user.

Variation and freedom of choice

Variation serves the human desire for surprise as well as fascination. A certain degree of unpredictability contributes to the fun of using a website. Variation can be used to counteract boredom caused by routine and repetition. (Naumann, 2012)

1.4.4 QUALITY CRITERIA ACCORDING TO NAUMANN

In her book "Joy-of-Use", Naumann (2012) examines quality criteria for the realization and measurement of Joy-of-Use, which can help to design better interactive products. The following quality criteria provide the framework for the research development of this thesis.

The research framework of this thesis has been elaborated based on these quality criteria which will be further researched in the following.

One of the criteria is individualization. In her research, Naumann (2012) refers to the book Funology, by Mark Blythe (2008). Individualization describes the possibility for the user to design his own story or ritual which can lead to more familiarity during use. Digital technologies can be used to develop intelligent products that adapt to the user. (Blythe & Overbeeke, 2008) Arndt (2006) expresses the ability to personalize interactive applications in a more concrete way. He says, even using your own profile picture or avatar makes software customizable and can improve the Joy-of-Use. (Arndt, 2006) Another criterion that Naumann obtains from the area of game design is the concept of challenge regarding the Joy-of-Use. A challenge for an interactive application is fulfilled, if it offers new possibilities of interaction within the scope of the user's abilities. The challenge must always be adapted to the skills of the player so that he sees himself up to the task. If the player thinks that he cannot master a

challenge, this quickly leads to frustration. On the other hand, the player gets bored very quickly if the challenge is too small. (Schell, 2012)

One more criterion, which is also used a lot within game design is the motivation through curiosity. Schell (2012) says, that a possible approach to the definition of play happens through the fulfillment of duties, the more you feel committed to something, the more it feels like work. In contrast, playing is associated with little duty and is therefore always voluntary. If you manage to appeal to the curiosity of the user and not so much to fulfill the duty, the user will feel more joy. For example, instead of thinking about the money at the end of the month, a line worker could motivate himself with the following questions:

"Can I set a new record?"

"Am I faster today than yesterday?"

The answers to these questions arouse curiosity, bring more joy and thus let the fulfillment of duties decrease. (Schell, 2012) In addition, the integration of the element surprise is an important part of game design to increase motivation. According to Schell (2012), the human brain is set to enjoy surprises. One of the most important criteria is the criterium of control. Within the book Funology, Blythe and Overbeeke describe the importance of user control as the following: Demands without the experience of control will result in a stressful and frustrating experience, rather than the experiences of joy (Blythe & Overbeeke, 2008). Therefore, interfaces should be intuitive to use and not too complicated.

Furthermore, Naumann (2012) refers to the book Funology, where the term “hedonic” is used, which means joy in Greek. Blythe and Overbeeke (2008) divide the hedonic functions of products into three criteria. The first criterium is stimulation, as people strive to develop personally, whether it is to acquire new knowledge or to acquire new skills. For products to stimulate, they have to offer new impressions, insights or opportunities. This can be done through new, interesting or hidden functionalities, content, design or interaction options (Blythe & Overbeeke, 2008). Another criterion is the identification with a product. A product must communicate a certain identity in order to meet the users' wish to express themselves individually through objects. According to Blythe and Overbeeke (2008), people tend to prefer products that allow them to present their personality to the outside world (Blythe & Overbeeke, 2008). The last qualitative criterium of Joy-of-Use is evocation, or easier described as causing thoughts and associations of past events. For example, if an adult man looks at his little yellow toy car at home and immediately associates it with his favorite city, this is a good example of how products can evoke memories. (Blythe & Overbeeke, 2008)

1.4.5 SUMMARY OF THE CRITERIA

The criteria described by the various literature for a Joy-of-Use product are often similar and the criteria partly merge. Individualization, challenging the user and enabling social interaction are particularly often described. The following criteria are especially relevant and will form the basis for the measurability of Joy-of-Use in the course of this thesis:

- individualization
- reasonable challenges
- arousal of curiosity
- social interaction
- identification with the product
- stimulation of the intellect
- control of the application as the basis for Joy-of-Use

Creating an experience for the user is of particular importance. It is emotions and positive experiences with the product that make the user experience Joy-of-Use. Usability as a basic requirement for Joy-of-Use is described by literature as indispensable. The user can only experience Joy-of-Use if the system is absolutely usable. If the user cannot do his job satisfactorily, it is unlikely that he will also have a Joy-of-Use experience that will encourage him to continue using it. If, for example, the links lead the user to a dead end or if the white writing on the yellow background is difficult to read, negative emotions are created before Joy-of-Use can be elicited. The user does not have to be aware of these sensations, but they do influence their impression about the interactive product and their willingness to use it again.

The criteria described above should be reflected in the testing of the underlying project. In order to provide a baseline for a research design with older people, the first step is to research the information required for a suitable usability for the respective user group. The next chapter will therefore explain the term user centered design. Following this, the needs of older people with regard to usability will be examined in more detail.

1.5 USER CENTERED DESIGN

As described in chapter 2.3., according to Jordan (2002) providing a good functionality and especially usability is necessary to guarantee and build Joy-of-Use. To adapt the usability to the functionality it is important to know the user group and to integrate them into the development process. A user-centered design approach should ensure this for the practical part of this work. (Jordan, 2002) The term user-centered design has been created by Donald Norman and Draper (1986) within their book "User-Centered System Design: New Perspectives of Human-Computer Interaction". Norman and Draper describes a philosophy and further a collection of methods on how to include the user during the process of development. (Norman & Draper, 1986) The user-centered design process, as shown below in figure 3, is an iterative procedure that goes through several phases. In most process models, such as DIN EN ISO 9241-210 or ISO/PAS 18152, the definition for usability engineering and ergonomics of human-system interaction these are the following four phases.

Analysis of the context of use

During the analysis of the usage context, information about future users is collected and summarized in user profiles. The tasks and objectives of users, work processes and the working environment, which also includes the technical framework, are also analyzed.

Definition of the requirements

Based on the findings of the usage context analysis, requirements are defined that need to be implemented during the design process.

Concept and design

In the next process phase, concepts for the future product are developed first. These will continue to be worked out until a complete draft is available. As a result of this phase, design documents, mockups or paper prototypes can be created.

Evaluation

Finally, the created concepts and designs are discussed with users, mockups and prototypes are tested. All of this serves to ensure that the users´ requirements are actually met.

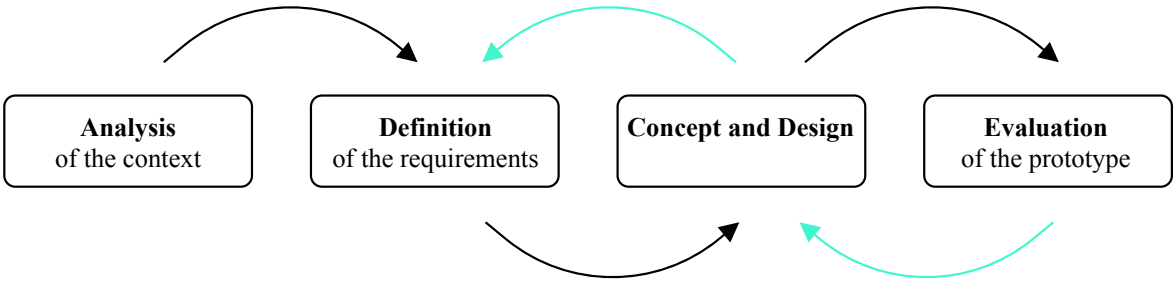

Fig. 3 Process of User-Centered Design

In order to create the interfaces, it is essential to know about who the users are and how to integrate them into the design process. According to Eason (1987) there are three different user groups that need to be taken into account:

- Primary users
- Secondary users
- Tertiary users

User groups who regularly use a product are defined as primary users. Secondary users are user groups who occasionally use the product. Tertiary users are user groups that only use the product indirectly or decide on its composition. (Eason 1987) Within this thesis, a dialogue with the primary user group shall be approached. The primary user group of the Never-too-old project is the older generation. The secondary user group of the project “Never-too-old” is mainly found in the group of users who use the application exclusively as content users or buyers. The third user group, concerns organizations that serve as mediators between the application and the primary user group. This user group can be particularly important in the application’s early development phase in order to better categorize and understand the needs of the primary user group. In order to keep a focus on the actually relevant information regarding the research questions, (see chapter 1) The focus within this thesis is mainly on the analyzation of the primary user group. To understand the primary user group for the project in particular, this group is described in the following chapter.

1.6 DEFINING "SENIOR CITIZEN" – THE PRIMARY USER GROUP

To understand the main user group, it is relevant to define it in the first place. Subsequently, it is important to analyze and understand known usability approaches and gaps for the selected user group. Within the accompanying, practical project, the main user group refers to persons +60 years of age who have at least some technical affinity. At this stage of iteration, it is not possible to differentiate more diversely between the user group. In the following Master thesis, the term senior will be used for users aged 60 years or older. Of course, this age range is a simplification since it´s not as if people change all their behaviors on their 60th birthday. The human-aging process starts when you turn 20. People in their 40s already have sufficiently reduced eyesight to require already larger font sizes than people in their 20s. (de Magalhães et al., 2005) Regarding the use of digital technology, the Nielson Norman Group found out that between the ages of 25 and 60, people's ability to use websites decline by 0.8% per year. Nevertheless, the reality is, that smartphone usage among the elderly is constantly growing. The "PEW Research" center revealed, that 59% of seniors within the U.S. between 65 and 69 own a smartphone. (NW et al., 2017)

One reason for the increasing usage of information technology is the ageing process of generations. The Baby Boomer generation is now reaching retirement age. This generation, born between 1946 and 1964, is far more likely than past generations of seniors to have had more substantial experience with information technology. With the rapid increase of digital content usage among elderly, it gets more and more important to include them. Nevertheless, sites and applications designed by and for young people are often inaccessible for older users.

The Nielson Norman Group found out, that throughout their conducted studies, readability has remained the most important issue for seniors throughout their studies. Websites and applications with tiny font are common. Interactive elements such as buttons, dropdowns, and links are often displayed at a small size that is difficult for older users to click on or tap. Although seniors found applications on mobile to be convenient, readability challenges on these devices were significant. Interface text on mobile applications was often too small in size and lightly colored for seniors to read comfortably (Kane, 2019). In the following section the state of the art regarding research within creating digital interfaces and projects for seniors will be analyzed.

CHAPTER 2 – STATE OF THE ART

Within this section the existing knowledge in the development of applications for older people is described, which in particular, refers to usability findings. These insights will be collected at the end of this section and shall serve as a guideline for the project “Never-too-old”.

2.1 USABILITY ISSUES WITHIN THE TARGET GROUP

According to ISO 9241-11, the term usability is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” Jakob Nielsen (2012) describes the term as quality attribute that assesses how easy user interfaces are to be used. Within his book “Usability 101 - Introduction to Usability”, also published by the Nielsen and Norman group, Nielsen's research team describes usability hurdles for older people. The following descriptions are intended to assist in the development of the practical project in order to make the content to be tested as user-friendly as possible.

The Nielsen & Norman Group found, that seniors often correctly felt that websites and applications were not designed with consideration for their needs and interests. One senior said that he felt “left out” of the online world because it was created “with someone very different than me in mind.” Another senior observed:

> “You look at things that are on the internet and it’s skewed towards not my demographic. The younger people, this is their medium. People my age did not grow up with it. People my age are not in charge of it. Online, there’s a quest to be cool and old people are not necessarily cool.”

Another study participant observed, “the internet is unfriendly to people with bad eyesight.” Websites and applications with tiny font are common and readability is an important element in designing inclusively for the elderly. Interactive elements such as buttons, dropdowns, and links are often displayed at a small size that is difficult for older users to click on or tap.

Further, seniors often had problems reading error messages, either because the wording was obscure or imprecise, or the message’s placement on the screen was hard to find. When seniors encounter error handling, simplicity is even more important than usual. It is important to focus on the error, explain it clearly, and make it as easy as possible to fix. A recent research published by the Nielsen & Norman Group and written by Kane (2019) shows that digital products still discriminate against seniors. Content written for and by older people is difficult

to find. When this content is available, it often treats seniors as a niche interest group rather than a diverse and growing demographic. By embracing both accessible design and an inclusive content strategy, online businesses can vastly expand the amount of business that they generate from this population. (Kane, 2019)

2.2 USABILITY GUIDELINES FOR THE PROJECT

It is evident that software often has a discriminatory effect on older people. The research described in the following is intended to achieve the most usability-friendly application possible for the respective target group. As described in the previous chapter, people in older generation groups often feel excluded. An important term, when it comes to designing for the elderly, is inclusive design. To design inclusively helps to create products that serve as many people as possible. (Xiao, 2018) Apple describes the term inclusive design within their human interface guidelines as follows:

"Inclusive design gives more people the opportunity to enjoy your app by ensuring that everyone can use and understand it. These three best practices can help you create an inclusive app." (Best Practices—Accessibility—Human Interface Guidelines—Apple Developer, o. J.)

In detail, Apple names three best practices for inclusive design. They start with accessibility, what they describe as making information available for everyone, regardless of their capabilities or situation. To create accessibility for everyone, the human interface guidelines of apple suggest using familiar and consistent interactions to make complex tasks as simple as possible. Another best practice, apple advices is the support of personalization, which means to make the user interface more adaptable. By using standard controls to implement into the application's UI, text and interface elements automatically adapt to several accessibility preferences, such as bold Text, larger text, invert colors, and increase contrast. Within the third best practice, Apple advises to audit and test the application to create a better accessibility. In detail they point out, that testing, and auditing helps to ensure that all users can complete the most important tasks within the application. (Apple, 2019)

While looking at the human interface guidelines of Apple it becomes obvious, that accessibility is the core objective of their understanding of inclusive design. However, designing inclusively means much more than making an application simply accessible.

2.2.1 GUIDELINES FOR READABILITY

The term that occurs most frequently with regard to usability for older people is readability. Within the Nielsen & Norman research written by Kane, one respondent describes that the internet is unfriendly to people with bad eyesight. (Kane, 2019) This fact refers in particular to two factors, which will be examined in more detail in the following. Within the development guidelines of Apple, it is described, that if the application doesn't necessarily need a custom font such as for branding or to create an impressive user experience, it's usually best to use the system fonts. If a custom font is used, it is important to make sure it is readable even at small sizes. Furthermore, it is described that italics and all capital letters for long text passages shall be avoided since it makes the text difficult to read. One point not mentioned within Apple's guidelines is the minimum size for developing digital solutions for older people. Of course, this can vary depending on the device and especially the contrast of the colors used. Nevertheless, it is important to set a minimum font size for development. In a study by Kenji Kurakata (2013), it was found that the minimum size for the legibility of text for seniors should be at least 12 points. Converted to digital pixels this means at least a font size of 16px. (Kurakata, 2013)

Another point besides the appropriate font selection is the choice of the right colors and contrasts. The development Guidelines of Apple (2019) suggest using strongly contrasting colors to improve readability. By increasing the color contrast of visual elements like text, glyphs and controls, the content used can be interpreted by more people. To find out if the developed UI meets minimum acceptable levels of contrast regarding readability, an online color calculator based on the Web Content Accessibility Guidelines (WCAG) will be used in the early development stages of the project.

The book “Inclusive Design” patterns by Hendon Pickering (2016), however, describes that an extreme contrast between font and background can also lead to blurred text. People who suffer from scotopic sensitivity syndrome, for example, are no longer able to read the desired text. It is therefore recommended to work with a font color hex code brighter #00000 (black) when using a background color of #FFFFF (white). (Pickering, 2016)

2.2.2 GUIDELINES FOR INTERACTION

Controls that are too small can be frustratingly difficult for elderly users to hit. (Kane, 2019) This statement is also confirmed by the research of the Nielsen and Norman Group, in which the frustration of the target group is expressed. They describe that older users make more

mistakes than younger users do. Their study participants often commented on errors, saying “I fat-fingered that one”. It’s a classic finding in usability research that users blame themselves, although it should actually be the task of the designer and the developer to minimize these obstacles. (Kane, 2019) To make the interaction as barrier-free as possible for the older user, the right size of the hit zones is therefore an important point. Hit zones describe the clickable area surrounding an interaction element.

The development guidelines of Apple (2019) suggest a minimum hit zone for all controls and interactive elements that measures at least 44pt x 44pt. To facilitate the interaction regarding the navigation through the application it is important to mark the buttons accordingly. Apple describes that it is important to have a consistent style hierarchy to communicate the relative importance of buttons. By using a consistent hierarchy of button styles, elderly people can grasp the importance of buttons based on their appearance.

2.2.3 GUIDELINES FOR DEVICE CHOICES

In a research conducted by Smashing Magazine, a web design magazine, people over 65 were asked about their smartphone usage. The result was that many of the people interviewed described the small screen size as annoying. This even led to the fact that some information that can only be read on the smartphone, such as SMS, was ignored completely. (Campbell, 2015)

In a US study, it was discovered that 32% of people between the ages of 65-69 own a tablet. (Anderson et al., 2018) Although these figures are valid only for the United States, they still provide a rough reference value for Europe. The fact that so many older people now own a tablet means that the relevant content and UI elements must be visible on a tablet´s screen size. Within this study, the implementation of the practical project was therefore based on the reference size of the iPad Pro (1366 x 1024px). Smaller screen sizes for smaller tablets and smartphones are not taken into account due to their too small size.

In order to support the findings of the literature research, additional experts have been interviewed. Some of these experts have also developed websites or applications for older people. The findings on this are presented in chapter 5 “Qualitative Pilot Study”.

CHAPTER 3 – RESEARCH DESIGN

Looking at the numbers shown in chapter 3, it becomes clear that generations have to move closer together. Especially digital solutions should act as a mediator between generations. However, digital services, social behaviors and technologies combine to create a growing technological generation gap. While especially solutions for younger people tend to explode, inclusive designed solutions for all generations are still quite rare. Within the thesis the main objective is to get a better overview on how to create a digital product which is inclusive for older generations. This means, the criteria for Joy-of-Use researched in chapter 2.3. must be examined within this paper to understand which Joy-of-Use criteria are relevant for the respective user group.

Although the main focus within the testing is on the measurement of Joy-of-Use, the usability of the application still plays a role, since function and usability are also considered attributes for the development of Joy-of-Use. See chapter 2.3.3. Joy-of-Use according to Jordan (2002). These results in the following questions, which are to be answered within this thesis.

Which criteria for achieving Joy-of-Use must be considered when developing digital applications for older people?

Which recommendations for action can be given for the project “Never-too-old” with consideration to Joy-of-Use?

As already highlighted in the previous chapter “State of the art” , there is a lot of existing knowledge regarding usability and readability in relation to older people and the use of digital elements. In order to actually design more inclusively, however, it is necessary to analyze also the factor of joy more closely. In the following section, the research design will be described in order to answer the defined questions. Therefore, this chapter describes the research design of the empirical study, the data collection and the data analysis.

The research design is divided into a pilot phase and a main research phase, which will now be explained in more detail. In a qualitative pilot study, experts in the field of ageing society will be interviewed. This phase should help to identify the relevant needs of the primary user group. This phase can be seen as a preparation phase for further testing and is relevant for an efficient execution of the primary user group testing.

The second phase of the testing refers to the primary users of the application. During this phase older people will be confronted with the concepts of the application “Never-too-old”.

The methods used to obtain the findings take place in an open interview combined with methods from user experience design. These methods are explained in more detail in the next chapter. The focus of this phase is the measurement of the Joy-of-Use criteria from chapter 2.4.5. which are presented again in the following:

- individualization
- reasonable challenges
- arousal of curiosity
- social interaction
- identification with the product
- stimulation of the intellect
- control of the application as the basis for Joy-of-Use

In the following, the expert interviews and the primary user group research will be explained in more detail.

CHAPTER 4 – EXPERT INTERVIEWS

Summary

Prior to the design process of the primary user study, a qualitative exploratory study has been conducted. Within the following description of qualitative research, experts in the field of the ageing society industry have been interviewed. This phase should help to identify the relevant aspects of the application in terms of functionality, usability and branding. This phase can be seen as a preparation phase for the testing with the primary user group.

4.1 METHODOLOGY – EXPERT INTERVIEWS

The non-standardized interview was selected as the survey method from the area of qualitative social research. In this form of interview, neither the interviewer's questions nor the interviewee's answers are standardized. The sub form guideline interview works with a given topic and a list of questions, the guideline. However, the wording of the questions and the order of the questions are not binding and enable the interview partners to conduct the conversation as naturally as possible (Gläser & Laudel, 2020).

With the help of the question guideline, selected experts on the topic were interviewed for this work. For this work, the word expert is to be understood in the sense of people who have special knowledge in working together with elderly people. Expert interviews are especially relevant in the exploratory phase of a project. Talking to experts can serve to shorten time-consuming data gathering within the literature review of a research as well as in the development phase of a project. Besides the time-saving aspects of talking to experts, it can also be used to get insider knowledge, which would not be accessible otherwise. (NW et al., 2017) Guideline interviews can be conducted in person, over the phone or by writing. For this investigation, the interviews were partly carried out in person and partly by phone (skype). The interviewees were asked before the interviews whether it was okay to record the conversation digitally. The choice of interview partners is an important factor in determining the type and quality of information obtained through the empirical research. For the present work it was important to examine the topic from different perspectives. Therefore, a diverse group of experts has been interviewed, which are listed in the following:

Ana João Sepúlveda - http://www.40maislab.pt

Ana João Sepúlveda describes herself as “Longevity Economy Expert”, she has a PHD in Sociology and leads the 40+ Lab. The 40+ Lab is a business consultancy which is specialized in the longevity economy. The consultancy is focusing to transform Portugal into an age-friendly country. Ana is an expert in the field of Ageing Society and understands the needs and benefits in working together with elderly people.

Elena Parras - https://55mais.pt/pt/

Elena Parras is the founder of 55 corn. The start-up provides a platform where elderly people can offer their services in different areas. The areas range from gardening, giving music lessons to housekeeping. Elena Parras brings a lot of experience when it comes to building a digital business for older people. At the same time, she is in contact with a lot of organizations and individual seniors.

Klaudia Bachinger - https://growwisr.com

Klaudia Bachinger is the founder of Wisr, Wisr is a start-up company founded in Vienna, which mediates older people with companies. Her clients include large companies such as PWC, Ritz Carlton and the Spar Group. The older people usually take on mentoring roles and support with their experience. Klaudia Bachinger is an expert in building networks in the field of ageing society and has a lot of knowledge in building user friendly websites for the respective user group.

In their literature, Gläser and Laudel (2020) describe that the interview guidelines should at best differ depending on the expert. This serves to get the best possible overview of the entire field. (Gläser & Laudel, 2020) However, the interview guidelines for the qualitative research of this work differ only in certain parts. As already explained in the section above, the conversation should take place as naturally as possible. The questions were therefore relatively open-ended and thus enabled the interview partners to communicate as freely as possible. The questions asked were for example:

- What kind of service do you offer and how can I imagine the process?
- Do you think there is an interaction gap between old and young?
- What is the most difficult part in working in that area of elderly people?
- What role do organizations play when working together with elderly?

- What channels do you use to communicate with older generations?
- What do you think can especially older people teach younger generations?
- What factors do you think motivate elderly people in using a website/digital solution?
- What things do you need to be aware of when working with the elderly?
- If you could define 3 personas 60+ how would you define them?
- What is your experience with elderly and technology?
- What do you need to be aware of, when you design a digital product for the respective target group?

For a detailed evaluation of the interview results, the method literal transcription by Mayring (2016) was chosen. In contrast to the memory protocol, which has the risk of data loss, this method is suitable for relieving the interviewer of recording during the interview and for concentrating fully on the interview. (Mayring, 2016) The interviews have thus been recorded using a digital recording device after the interview partners had given their consent.

4.2 RESULTS OF THE EXPERT INTERVIEWS

A suitable qualitative evaluation method must be selected to match the qualitative survey method of the non-standardized interviews. Since interviews with experts lead to intensive discussions, not all information is relevant to the underlying work. For this reason, the method of qualitative content analysis was chosen. Qualitative content analysis allows to reduce and structure the mass of information systematically to the relevant parts for the investigation. (Gläser & Laudel, 2020) The aim is to create a compact corpus that reflects the selected material, namely an abstract and linguistically simplified summary of the analytically relevant communication content. In this way the material is gradually generalized and the amount of material is reduced. (Mayring, 2016) The data presented from the expert interviews has therefore been systematized for a better overview. The extracted data of the interviews was thus assigned to the following categories.

4.2.1 DIGITALIZATION IN OLDER DEMOGRAPHICS ACCORDING TO THE EXPERTS

Two out of three of the surveyed experts described older people as digitally savvy from their experience. One respondent said, that in her experience more than 80 percent of people 65+ have a digital affinity and had no major problems in using digital tools. Rather, most users of the interviewed organizations and projects are on social networks such as Facebook or Instagram. Communications about upcoming cooperation's actually takes place exclusively via Facebook messenger and WhatsApp. However, one of the interviewed experts said that the digital skills of older generations could not be compared to that of generations as for example millennials. It is important to use as little complexity as possible. Many of the older people would be able to get along with the basic control of digital tools but would often need help from their relatives or other caregivers in more complex digital activities. Tools like Facebook and WhatsApp are used a lot by older generations to keep in touch with their relatives. It is therefore advisable to take certain UI patterns and wordings from it. Bachinger also advises that unnecessary content and information should be avoided during development. It is important to reduce complexity and focus on a simple user experience. The path to an intuitive user experience is a long process and only possible with the feedback of actual users. One interviewed person said:

"At the beginning we asked ourselves if we can be a product for everyone? We quickly came up with the answer that this just isn't possible, so we just focus on the elderly, who have a certain level of competence in the digital field. (...) Inclusive design is a complete waste of time and sometimes hinders a functioning business model. Rather, you notice that when you create a good solution, potential users usually find a way to gain access. Creating motivation is therefore an important element of designing as inclusive as possible."

In general, two of the experts said they think, that social interaction is the key motivator for the use of digital tools within the respective target group.

4.2.2 DEMOGRAPHIC EVOLUTION AND TRENDS ACCORDING TO THE EXPERTS

All of the experts see a drastic need for action around the topic of ageing society. One of the interviewed experts said that the term aging society was a little out of date because it sounds too negative. Longevity is a better term and more clearly describes the possibilities and advantages associated with the demographic change. Further she said, that

“The Longevity Economy will become the third most important strategic pillar for the world economy, and countries such as China, Japan, Australia, The Netherlands, France and Ireland already have strategies in place.”

Another interview partner said,

“I am currently noticing an increasing need for solutions regarding older people who want to stay active. Many people suffer from loneliness and depression after retirement and actually want to be part of social activities, unfortunately the only thing that is often lacking is accessibility.”

4.2.3 GAP OF INTERACTION BETWEEN YOUNG AND OLD ACCORDING TO EXPERTS

All of the interviewees answered the question, whether they think that there is a generational communication gap between old and young, with yes. An expert justified this fact with the following statement:

"This is how social life works today, especially in urban regions it feels like being in a jungle. It is particularly difficult for older people to keep up with the fast pace of life today. (..) digital services can be a mediator between generation and make common interests or needs visible.”

Another expert said that intergenerational exchange is particularly important to see the whole picture. She works with older people every day and realizes that there is a lack of understanding for other generations on both sides. All experts shared the opinion that especially in a fast-moving time like nowadays, young people could learn from the values of older generations. One interviewed person said:

“Many young people would like to have more contact with older people, but there are also a lot of young people who say they don't like contact or even really say they hate old people. (…) this is mostly linked to climate or political issues where the entire older generation is accused of how they did business decisions.”

The same interview partner notices that younger generations often don’t see the diversity of older generations instead elderly people become blurred into a homogenous group.

4.2.4 INTERACTION GAP THROUGH DIGITALIZATION ACCORDING TO THE EXPERTS

Digitalization has a major impact on the generational gap, especially regarding knowledge. Precisely because knowledge also brings power with it. In the last few years power has shifted towards younger generations through digital know-how. Older people who do not have digital skills lose their power and presence, especially when it comes to future and innovation issues.

4.2.5 WORKING WITH THE ELDERLY ACCORDING TO THE EXPERTS

To design inclusively, it is necessary to understand how collaboration models of existing services and solutions work. The goal was to recognize which support functions or partners are necessary in order to enable the fullest possible use for older people. Most of the expert described, that in the early phases of their project, the most important thing was to talk to organizations within the elderly society. Organizations help to reach out and create awareness for a service or a product within the elderly communities. One interviewer said:

“In the beginning I went straight to organizations and tried to market my service. In the following weeks, a kind of self-dynamic developed and elderly people approached directly to me, without the help of organizations. “

Another question along the guideline was related to potential hurdles when working with elderly people. The experts disagreed on that point. One expert said that older people need more support on some issues, than younger people. While another expert said:

“I wouldn’t say that the age is the difficult part. The challenges are the same with every other company. There is no barrier in working with the elderly, it is more how you adapt yourself to the opposite person.”

This roughly coincides with the statement made by another interview partner who says:

“The biggest challenge for all of us is the term itself, since the term senior can sometimes be understood as discriminating.”

There is simply no exact term for describing the target group. That's why two of the experts said, the term is one of the biggest challenges in the communication. Older people also want to be perceived as cool, innovative people and the terms senior or elderly are often negatively associated.

4.3 DISCUSSION

Based on the above findings, the following conclusions can be drawn for the research study:

(1) The digital skills of older generations cannot be compared to that of generations as for example millennials. It is important to use as little complexity as possible. It is important to focus on relevant content and try to minimize the unnecessary.

(2) A fully inclusive design is difficult to achieve. It is important to convince people in the target group with a good digital competence. They can then act as mentors for other people in the same age group.

(3) One of the biggest challenges is the description of the target group. The terms "old" or "elderly" can be understood as discriminating.

(4) Social interaction is a key motivational factor in using a digital tool for the respective target group.

Concluding, it can be said that the interviews with the experts confirmed the findings from the literature review. In the following section, the survey of the primary target group will be discussed. The findings from the literature review as well as the qualitative pilot study will serve as a foundation for the research design applied.

CHAPTER 5 – PRIMARY USER GROUP TESTING

Summary

This chapter deals with the objectives, methodology and approach of the testing. Central questions of the research design need to be answered in the following: “What are the objectives behind the testing with the primary user group”, "How should the result be achieved?" and "How is the test carried out? To answer these questions, the survey with the primary target group is divided into three qualitative elements. This chapter should help to better understand the process of data collection and finally the results presented. Within the following testing with the primary user group, the main objective is to find out which criteria can contribute to an increase in Joy-of-Use for digital applications. First and foremost, it is important to create empirical data in order to provide recommendations for third parties, but especially for the further development of the project "Never-too-old”. Before the process is explained, it is important to explain the selection procedure for test persons.

5.1 TEST PERSONS

The selection of suitable test persons should be representative of the later user group. However, with few test persons it can be difficult to consider all relevant groups. According to Sarodnick & Brau (2011), actual later users should be selected if possible. After consultation with the experts, described in chapter 4, it has been decided to target primarily +60-year olds with a certain level of digital skills. The expert interviews showed that digitally inexperienced persons could distort the test results. It was therefore recommended to start with digitally experienced persons first, as they usually act as mentors for digitally weaker persons in the same age group.

According to Nielsen (2000) already 5 persons are sufficient to uncover up to 75% of usability problems. (Nielsen, 2000) However, since usability can be tested more specifically, five people are not sufficient for a valid result within this study. By looking at other generative testings, usually 10 - 20 test persons are cited for a valid result. In a study conducted by Thomas Tullis and Larry Wood the minimum number of participants needed for a card-sorting study was assessed. (Tullis & Wood, 2004)

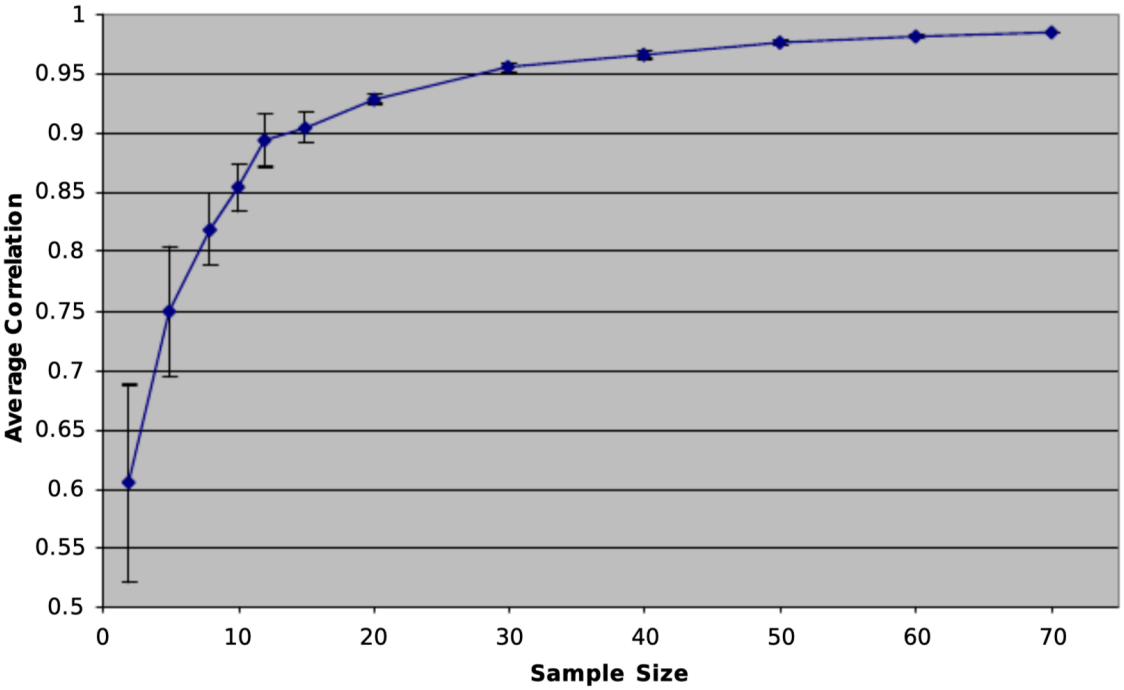

Fig.4 Number of Test participants according to Tullis & Wood

In the study by Tullis and Wood (2004), 167 users were presented with a list of 46 cards. The task was to sort and cluster the cards into specific categories. Afterwards they validated at how far the correlation deviates by reducing the number of test users. They found out that from a number of 12 test users on, the correlation was already only at a value of about 0.85. Since the number of concept possibilities to be discussed in this thesis is limited to only 6, it is assumed that 10-12 users are absolutely sufficient for a valid test result. After evaluating the expert interviews described in chapter 4, it became clear that there is a difference in behavior between older men and older women. In order to make the expected differences between the sexes visible, the same number of women and men was chosen for the study.

5.2 TEST ENVIRONMENT

It must be specified in which environment the interviews will be conducted. The choice also depends on the required infrastructure, the availability of test subjects and the time budget. Therefore, it was necessary to create the most suitable test atmosphere possible, in which the test persons felt comfortable. To carry out the appointments a meeting-room within the Co-Working space "Second Home" in Lisbon was rented. The plan was to invite the test subjects individually to the interviews.

However, due to the outbreak of the Corona Pandemic and the subsequent restrictions, this procedure had to be reconsidered and adapted. After consultation with the test persons, it was decided to arrange the interviews via the digital services Zoom and Skype. Therefore, it had to be made sure in advance that each participant had a computer at home, which would allow a problem-free screen transmission. After having adapted to the new test environment, the execution of the tests also had to be adapted which will be explained in more detail in the following section.

5.3 EXECUTION OF THE TESTING

The interviews have been estimated to last in total between 30 and 45 minutes in total. Before starting the tests, the test persons were asked whether sound recording was permitted during the tests to be performed. Furthermore, the test persons have been assured that the results will be used anonymously and that they can stop the test at any time. Before the start of the test, a personal introduction round was carried out. This is important in order to create a pleasant atmosphere. The more harmoniously the atmosphere, the more valuable the generated data becomes.

The execution of the test interviews was divided into the following 3 main phases, which are further identified with the acronym SE1, SE2 and SE3 (Survey Element n*).

5.3.1 SURVEY ELEMENT 1 – GENERAL QUESTIONAIRE (SE1)

The first part of the survey is based on a general questionnaire, which serves to get a better understanding about the user group and their motivational factors behind general website usage. Within this questionnaire the demographic information about the person as well as the user behavior of digital services has been questioned. The focus was primarily on the validation of the importance regarding Joy-of-Use and usability factors identified in chapter 3.1. and 2.4. Since the questionnaire was very short, it was a suitable option to create it with the online software Microsoft Forms. The complete questionnaire document can be found in the appendix of this thesis.

5.3.2 SURVEY ELEMENT 2 – CONCEPT VALIDATION (SE2)

After filling out the questionnaire the users were confronted with the prototype of the accompanying project “Never-too-old”. Never-too-old is a web application which provides older people a platform through which they can promote and offer workshops. This gives them the opportunity to connect with younger people and pass on their knowledge gained throughout their lives. In addition, there is a marketplace within the application where older people can sell their own hand-crafted in the beginning of the concept validation it was first necessary to give the test subjects an introduction about the project. During the introduction, not only the project has been discussed, but also the problem it is trying to solve: The existing generation-gap. After the project presentation, the participating test persons were asked to give their opinion on the idea and the topic behind it.

The main part of this survey element, however, was to find out which concept extensions could help to increase joy when using the application. A concept extension is understood within this thesis as an additional element, which extends the core functionality (in this case the presentation and booking of the workshops) by elements to potentially increase Joy-of-Use. Before the start of this part, the test persons were asked to put themselves in the perspective of a person who offers workshops to younger people in an area of their choice. Then, the participants were asked to evaluate six different concepts for increasing Joy-of-Use. The six concepts extensions were created with regard to the quality criteria developed in chapter 2.4.5. (Summary of the Criteria). In the following, the six concepts and the included Joy-of-Use criteria will be explained briefly. For a more detailed description refer to chapter 7 – Results.

(1) Reviews: Within this section, potential users have the opportunity to view comments and ratings on their offered workshops. The reviews are based on the researched Joy-of-Use criteria “social interaction” and “curiosity”.

(2) Trophies: This section offers users the opportunity to collect trophies by completing certain tasks. The trophies are based on the researched Joy-of-Use criteria “challenge” and “curiosity”.

(3) Leaderboard: In this area users can see how they compete against others in terms of workshops held based on a point system. The leaderboard is based on the researched Joy-of-Use criteria “challenge”.

(4) Trends: Here users can view current trends in the form of a news feed created by younger generations. Trends were based on the researched Joy-of-Use criteria “stimulation of the intellect” and “curiosity”.

(5) Personalization: This area offers the possibility to personalize the user’s profile by, for example, adding a profile picture. Personalization was based on the researched Joy-of-Use criteria “identification with the product” and “individualization”.

(6) Control Center: The control center offers users the possibility of transparency. Current statistics can be viewed as well as a calendar to determine when the next appointment will take place. The control center was based on the researched Joy-of-Use criteria “control over the application”.

The participants were asked to sort these different concepts in an order according to their personal perception of relevance. Additionally, the test persons were asked to give their own opinion on the idea and the prototype as well as the different concepts to improve Joy-of-Use within the application “Never-too-old”.

As the project is still at an early stage of development, the Nielsen&Norman group recommend generative methods for collecting relevant data. (Rohrer, 2014) Generative research can be described as the process to generate information about the potential users and their needs. It involves learning about what motivates the user, what satisfy the user or how they want to interact with a specific product. Generative methods are usually carried out in the first stages of a product cycle. (Rohrer, 2014) Therefore, within this survey element, the applied method can be described as a mix of two generative methods, concept validation and the method of card sorting.

Definition of Concept Validation

Concept validation is a method of showing design, concepts, screens or ideas to potential users to find out, whether the users feel a specific need or interest in the described object. (Slack, 2020) It is important to involve customers in the conceptual design phase to understand user needs, expectation, satisfaction and the motivation for using a specific application. In the preparation of the tests 6 different features were conceptually developed.

Each of the 6 features is based on one of the Joy-of-Use criteria described in chapter 2.4.3.. During the concept valuation the testers are confronted with the six different concepts and are asked about their opinions regarding each of these elements.

Definition of Card Sorting

Card sorting is after definition of the Nielsen and Norman Group a user experience research method in which study participants group individual labels written on notecards according to criteria that make sense to them. (Sherwin, 2018) This method describes how the target audience's domain knowledge is structured, and it usually serves to create an information architecture that matches users' expectations. However, card sorting can also be used to find out which elements in a website are important and which are not. (Sherwin, 2018) Within this thesis, the Card sorting method serves as an inspiration. At the end of the concept validation, the participants should therefore sort the six different concepts according to personal preference.

The results of the research are described in more detail in chapter 7. In the following, however, another survey element is described first in order to be able to qualitatively evaluate the concept of "Never-too-old".

5.3.2 SURVEY ELEMENT 3 –ATTRAKDIFF (SE3)

After the usage of the prototype, the test persons were interviewed in a survey of the type AttrakDiff to give their opinion about the current project "Never-too-old". (Hassenzahl et al., 2003) AttrakDiff is a tool for measuring the attractiveness of interactive systems. AttrakDiff shall help to clarify the perception of potential users. The data collected can be used to determine the attractiveness in terms of usability, appearance and any need for optimization of the tested product. Additionally, the criteria stimulation and identification are taken into account. AttrakDiff therefore gives a good overview of the overall impression of the product in terms of Joy-of-Use. According to Hassenzahl et al. (2003), the AttrakDiff questionnaire considers not only the ergonomic or pragmatic quality but also the hedonic quality of a product. AttrakDiff itself describes the scientific background of the tool as follows:

> "Ease-of-use, i. e. an optimal operability, is a must for interactive products. Increasingly, products stand out for their user experience. These days, it is necessary to apply an evaluation

method that records both the perceived pragmatic quality, the hedonic quality and the attractiveness of an interactive product."

According to Sarodnick & Brau (2011), pragmatic quality is the ability of a product to satisfy the need to achieve a goal by providing useful and usable functions (practical, manageable). The hedonic quality is the need of people to improve their knowledge and skills (creative, challenging), and to transmit self-value messages to other people (professional, connecting). The attractiveness of the system is inquired by general ratings (good, attractive). In the actual test, the user rates the application on the basis of 28 word pairs, between which he classifies his rating. The word pairs represent their respective opposites to each other, between which the evaluation can be graded. The 28 word pairs will be described within the presentation of the results.

The results are divided into the four categories pragmatic quality, hedonic quality of stimulation, hedonic quality of identification and attractiveness. The categories then again allow a classification in a grid of priorities according to the testers' perception. The narrower and more pointed the confidence rectangle in the result grid, the more homogeneous the results of the different test users. Figure 5 shows an example of this grid.

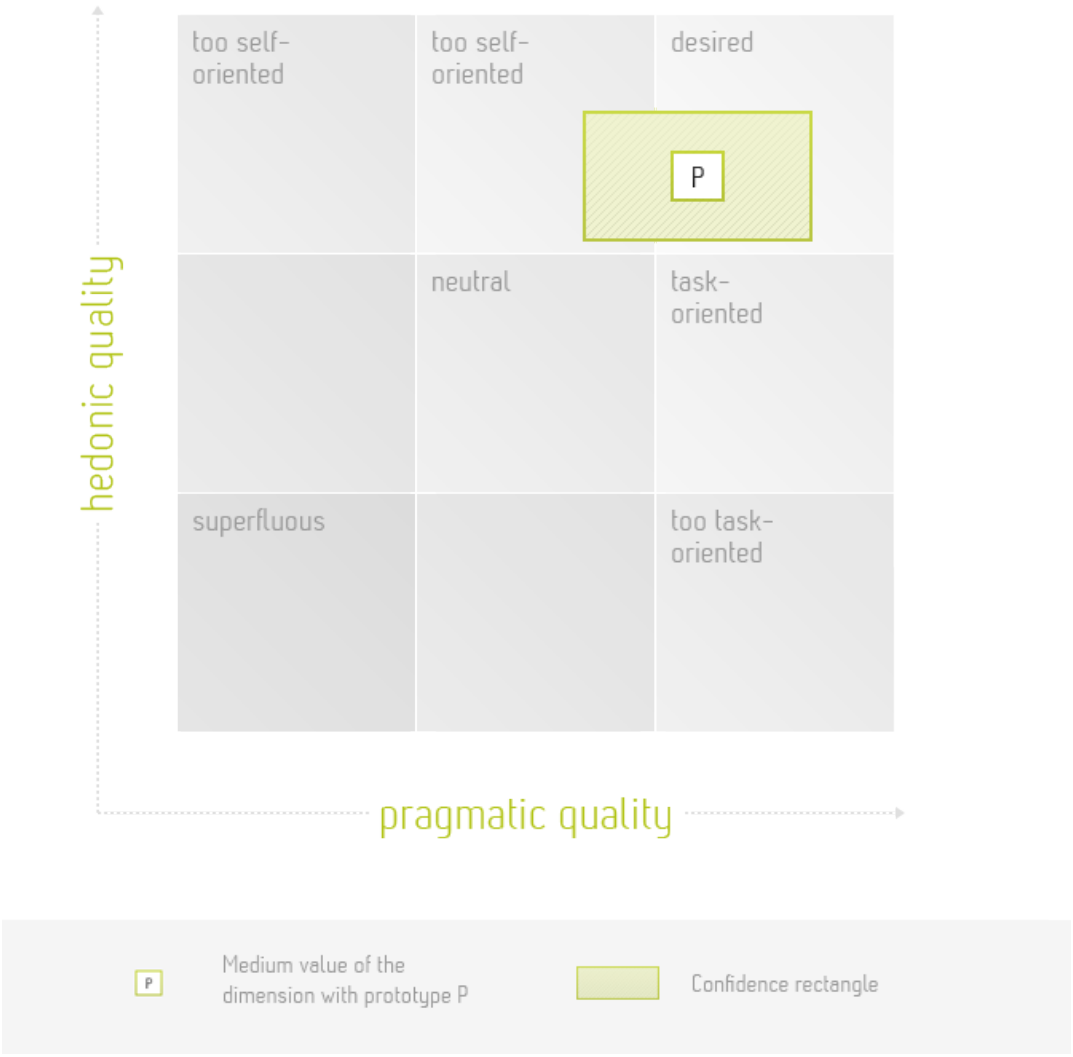

Fig.5 AttrakDiff grid according to Hassenzahl et. Al. (2003)

Hassenzahl et al. (2003) differentiate in their model between a pragmatic and a hedonic perception of quality. According to the authors, both pragmatic and hedonistic qualities are important in order to not only satisfy a user, but rather to create Joy-of-Use. Often software products are either weakly hedonic and strongly pragmatic (action-oriented products), or strongly hedonic and weakly pragmatic (self-oriented products). With action-oriented products, tasks can be completed efficiently and effectively, but the users do not have a strong bond with the product. Self-oriented products, on the other hand, bind the users more strongly. Moreover, the emotional consequence (joy) of such a product is also more pronounced. (Hassenzahl et al., 2003) The terms pragmatic quality, hedonistic quality and attractiveness can be described as

follows. Hedonistic quality can be divided into stimulation and identity and will thus be described consecutively.

Pragmatic Quality (PQ):

The pragmatic quality describes how well the tester can achieve his goals with the product. (Hassenzahl et. al, 2003) So for the tests used in this paper, how well the tester was able to use the Never-too-old application. This category most likely takes up usability criteria. (Hassenzahl et. al, 2003) The corresponding word pairs for pragmatic quality are for example:

Technical – Human, Complicated – Simple, Confusing – clearly structured, Impractical – Practical etc.

Hedonic quality - stimulation (HQ-S)

The hedonic quality – stimulation describes to what extent the application was able to stimulate the test user. The basic assumption is that people have a need for further progression instead of stagnation of their intellect. The word pairs should help to assess whether there is interesting content that, for example, that gives the test users this feeling of stimulative development. (Hassenzahl et. al, 2003) The corresponding word pairs for hedonic quality - stimulation are for example:

Conventional – Inventive, Conservative – Innovative, Undemanding – Challenging etc.

Hedonic quality - identification (HQ-I)

Hedonic Quality – identification reflects how well the test user can identify himself with the product. (Hassenzahl et. al, 2003) The corresponding word pairs for hedonic quality - identification are for example:

Isolating - Connective, Cheap – Premium, Unpresentable – Presentable etc.

Attractiveness (ATT)

Attractiveness best describes the test user's holistic perception of the product. (Hassenzahl et. al, 2003) The corresponding word pairs for attractiveness are for example:

Ugly – Attractive, Bad – Good, Repelling – Appealing etc.

CHAPTER 6 – RESULTS

Summary

Within the next chapter the results of the individual survey elements are to be described. In addition, the moderator's notes are included in the results. The previous chapter has already described the procedure for selecting the relevant test persons. In the period between 27.03.2020 and 10.04.2020 a total of 12 persons took part in the interviews. As described in the previous chapter, the survey consisted of three elements. The survey started with a personal interview, which included the presentation of the project and the validation of the concepts. In addition to the personal interview (survey element 2 – SE2), the test persons were asked to fill in two questionnaires. One was a general questionnaire (SE1), which questions the use of digital elements and the other was an AttrakDiff questionnaire (SE3), as explained in the previous chapter.

To present the results in an orderly manner, the results of the general questionnaire will be discussed first. By explaining the questionnaire, the characteristics of the target group become more apparent and the following survey elements can be better classified. At the end of this chapter, the most relevant findings are summarized and presented in an orderly manner.

6.1 RESULTS GENERAL QUESTIONAIRE (SE1)

This questionnaire collected general information about the test persons and their most relevant factors relating to the use of a digital service/software. As described above, 12 people took part in the survey. Of these, 6 were male and 6 females with an average age of 65.6 years. Nine of the 12 people described were already retired. Six of the respondents were from the UK, three were from Portugal and three were from Germany. The professions of the test subjects involved three former teachers, three former business consultants, a former police dog handler, a former secretary, a former medical doctor, a former accountant, a former gardener and a former university professor. In total, the participants rated their digital competence with 6.83 out of 10 points. The most favorite tools among the participants are Google (9 mentions), Facebook (6 mentions), Zoom (6 mentions), Skype (5 mentions), WhatsApp (4 mentions) and Instagram (2 mentions). Additionally, applications in the area of news and banking were mentioned. In another survey element, the importance of certain criteria in the use of a website/software was queried by using the Likert Scale. Within figure 6 the answers of the following question are shown. Within the following figure 1 represents “not important”, 2

represents “less important”, 3 represents “moderately important”, 4 represents “important” and 5 represents “very important”.

How important are the following criteria in using a website/software for you?

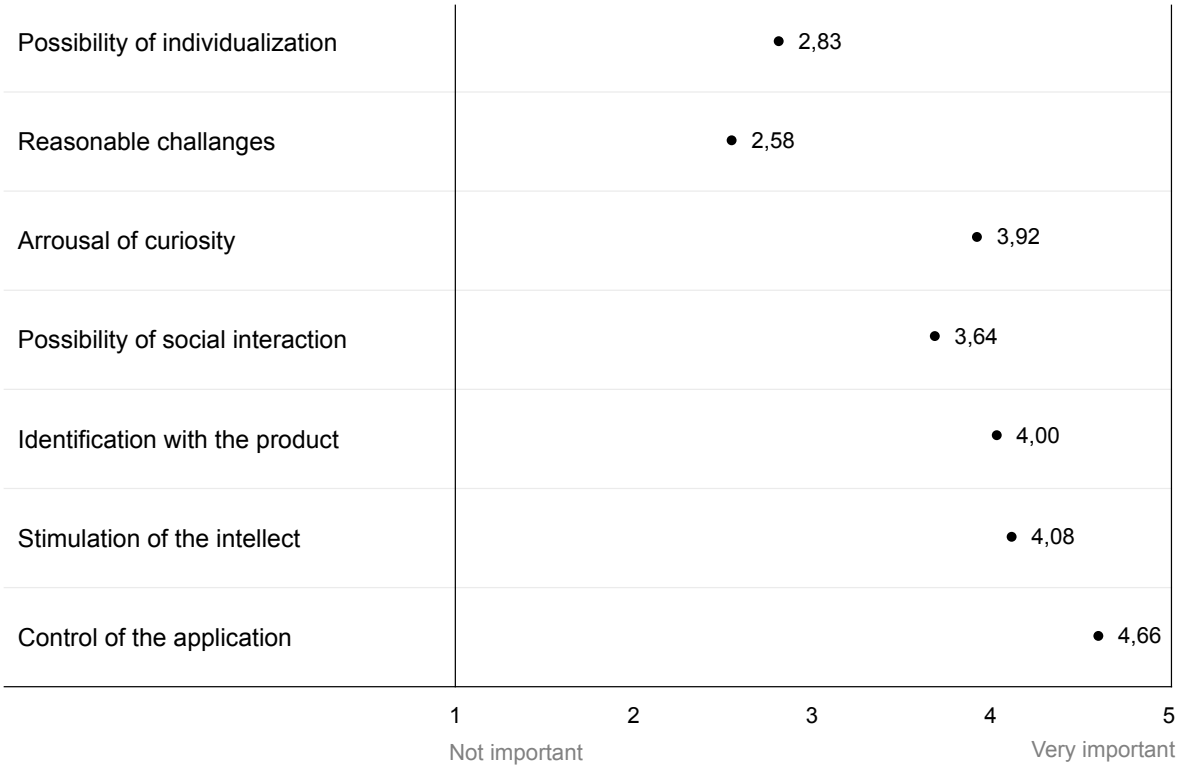

Fig.6 Result General Questionaire 1

The interviewed criteria were selected on the basis of the research in chapter 3.4.5 and were thus interviewed within the relevant target group regarding this study. The survey shows that individualization and reasonable challenges are rated between less important to moderately important. The possibility of social interaction was rated between moderately important and important, with a stronger tendency towards important. Curiosity, identification with the project, and stimulation of the intellect were evaluated as important criteria when using a website. Having control over an application in the form of understandable usability for example was rated as very important. In a further survey element, the test persons were asked to answer

which aspects are important to them when using a website. This question focuses on aspects concerning relevant user interface design elements. Figure 7 shows the answers to the question.

How important are the following aspects of using a website?

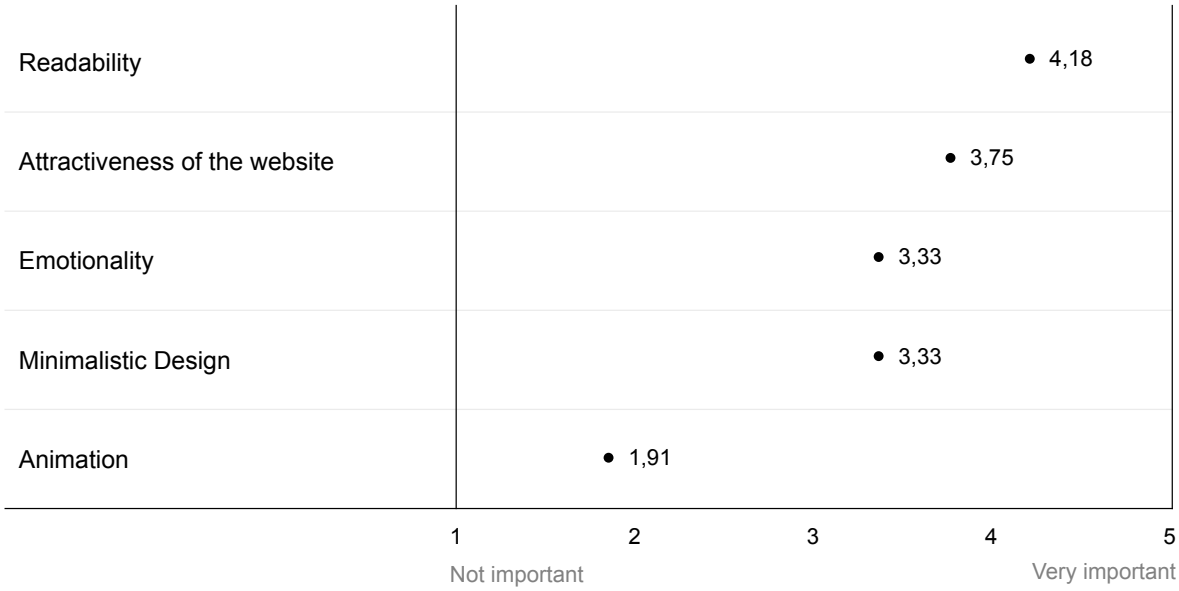

Fig.7 Result General Questionaire 2

Readability was rated by the respondents as important with a tendency towards very important. The aesthetics and attractiveness of a website is considered as important by the respondents. Emotionality and minimalistic design of a website have been rated between moderately important and important with a slight tendency to moderate importance. The integration of animations was rated as less important.

6.2 RESULTS CONCEPT VALIDATION (SE2)

Within the concept validation the application “Never-too-old” was presented to the test users. Additionally, six practical concept extensions (see chapter 6.3.2) to increase Joy-of-Use within the application have been presented. During the presentation the participants were asked to give their opinions and ideas at any time. At the end of the interviews the test persons were

asked to rate the six concepts for increasing Joy-of-Use and to sort them by their popularity. In this chapter the results of this part of the survey will be presented. In the first phase of concept validation, the basic concept of “Never-too-old” was presented to give the test persons a basic overview of the core functionality and the branding of project. Figures 7 and 8 show two essential parts of the introduction to the project.

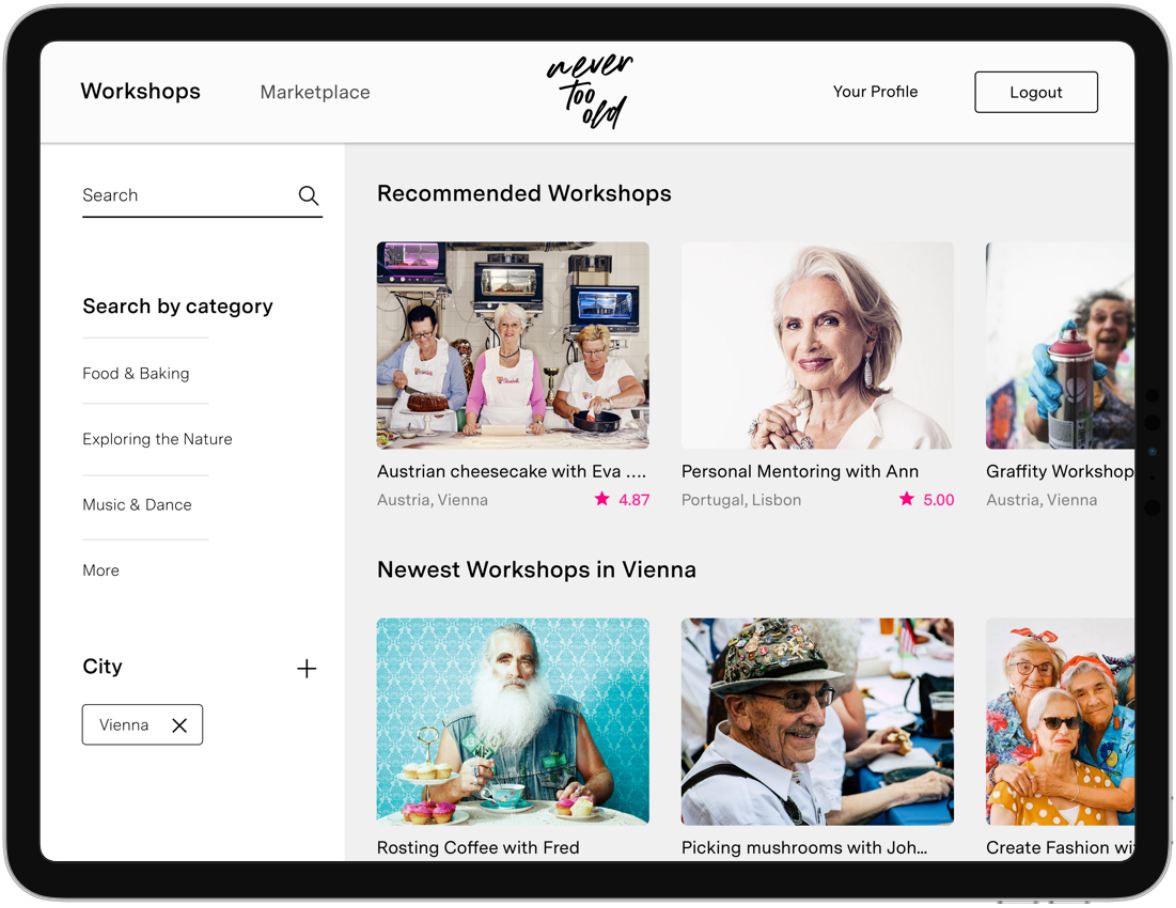

Fig.8 Never too old, concept of courses

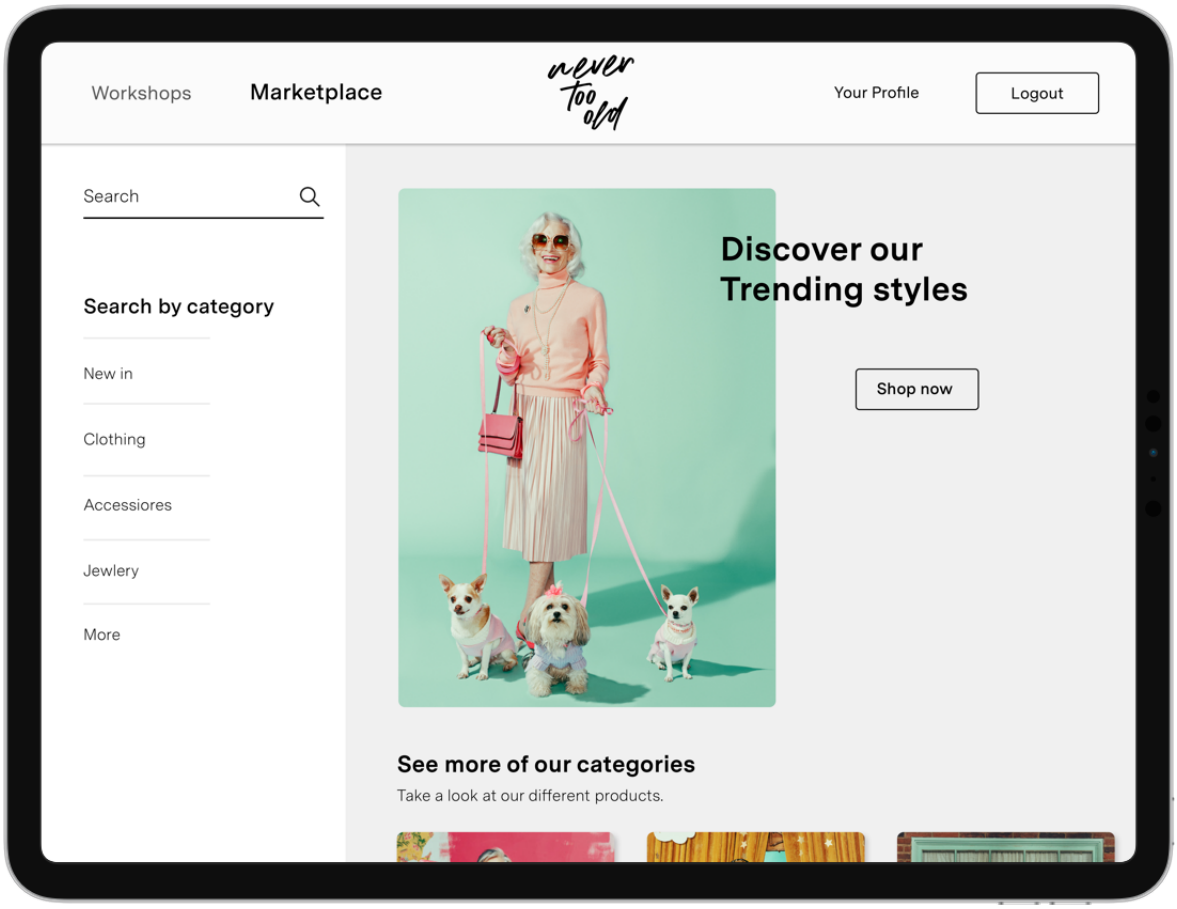

Fig.9 Never too old, concept of marketplace

The two screens show the two core elements of the application. Figure 9 shows the workshop part, while Figure 9 shows the marketplace. These elements are essential elements for understanding the application and the underlying use case. Further concept screens regarding the introduction can be found in the appendix of this thesis.

After the presentation of the basic concept, the test persons were asked to provide a first general feedback. The following section therefore describes some comments of the test users in the form of quotations. Redundant comments are not listed here due to clarity. The comments are thereby divided into the three different clusters general concept, service and branding.

Comments regarding the branding of the application:

"The term old in Never-too-old sounds a bit discriminating. How about never too mature or never too senior Just a thought"

"I like the look of the application"

"I like the pictures; it looks very vibrant"

"I don't like the name"

Comments regarding the concept of the application:

"I find the idea absolutely necessary."

"A great idea, I would love to give a course on dog training."

"I would use my free time differently, but I know many friends who would certainly use this service."

"I find both the workshops and the Marketplace very interesting."

In general, it can be said that the overall impression of the idea and the branding was very good. However, two people stated that the name of the application "Never-too-old" could be perceived as discriminatory by some people within the target group. The concept received positive feedback from all 12 test persons.

Especially the identification with the service was noticeable. The functional core of the application was well understood by all 12 people. It is important for the second part that the test persons understand the service well and, in best case, can identify with it.

6.3 RESULTS CONCEPT SORTING (SE3)

As already mentioned before, six different concept extensions for the potential increase of Joy-of-Use were presented to the test persons. The comments and evaluations expressed on these concepts are described below. Following, the test persons were asked to sort the concepts by popularity. The result of this sorting is presented and interpreted in the end of this chapter. The order in which the different concept extensions are now presented is the same as the order in which it has been presented to the test persons. Therefore, the test persons were asked to put themselves in the perspective of a person who offers workshops to younger people in an area of their choice. The test persons selected different areas. For example, one test person wanted to offer courses in dog training. However, most of the participants chose mentoring in business or health. Each of the concept extensions is now explained in more detail. In addition, individual screens for each extension are embedded. However, not all of the presented screens are presented in this chapter. The total number of screens is shown within the appendix. To make it easier for people to identify with the prototype, a male and a female version has been created.

6.3.1 REVIEWS

The first concept presented to increase Joy-of-Use was the potential integration of *reviews*. Within this section, potential users have the opportunity to view comments and ratings on their courses. The described concept is visualized in figure 10. Additionally, the pictures and names of the users are displayed and there is the possibility to exchange messages. This concept for increasing Joy-of-Use refers to the researched criterion "social interaction" and "curiosity" from Chapter 3.

In general, it can be stated that the test persons reacted very positively to this element. One test user said that it is very important for him to get a confirmation for everything he does. Another test person said that she would like to click on the picture to make it larger to have a closer look at the person who commented on the workshop. Only one test user said that he is not really interested in reviews in general. He further said: "to be honest, I think a lot of reviews in the internet are fake"

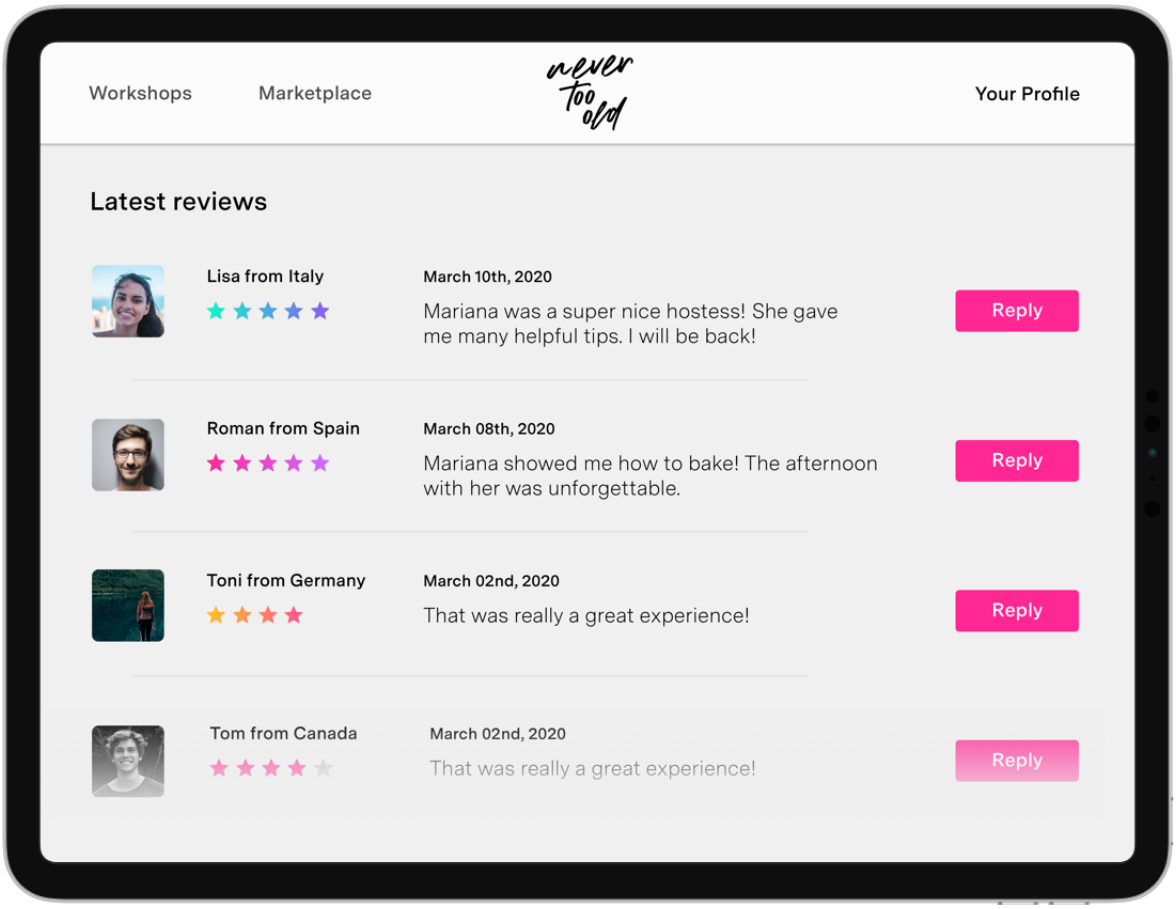

Fig.10 Never too old, concept of reviews

During the presentation of the review concept it was noticeable that all test persons were already very familiar with the topic of comments and reviews. Especially the fact that people were able to react to the comments was perceived positively.

6.3.2 TROPHIES

The second element that was presented to increase the Joy-of-Use was the integration of trophies. This feature would allow users to collect trophies by reaching a variety of milestones. Figure 11 visualizes the possible implementation of the concept. This concept for increasing Joy-of-Use refers to the researched criterion "challenges" and "curiosity" from chapter three.

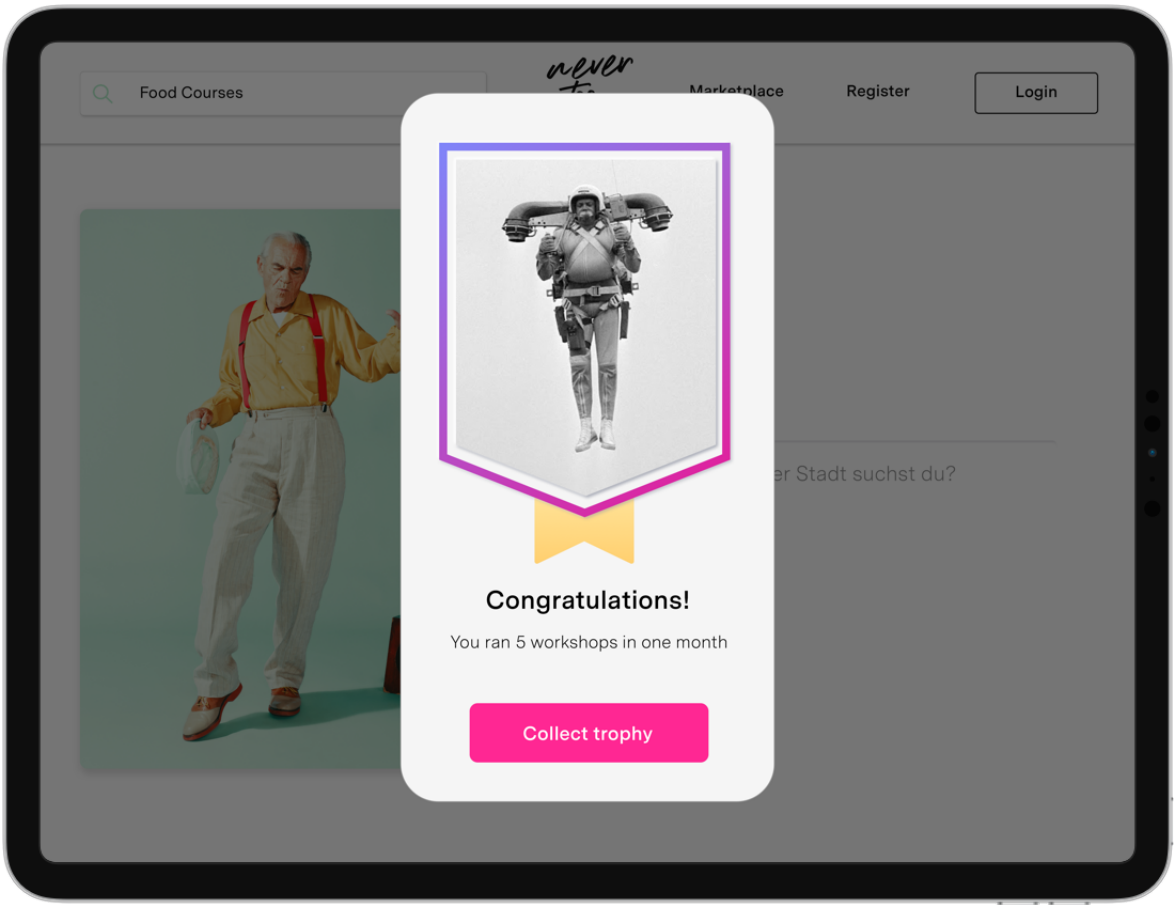

Fig.11 Never too old, concept of trophies

Comments on this concept were quite moderate. Only one of the respondents said that he really enjoys collecting things and thinks it's a good idea. However, the majority of those questioned were rather reserved and showed little interest on this concept feature. One test person said: "I have a sports app on my iPad that displays weekly milestones. Every week I get a new message. It's annoying."

6.3.3 LEADERBOARD

The next element that was presented to the test persons was the integration of a leaderboard. As shown in Figure 12, users can see how they perform compared to the other people. The development of the leaderboard was based primarily on the Joy-of-Use criterion

"challenge". Again, only a few test subjects were really convinced. However, it was interesting that three of the 12 people suspected that other people within the target group would be very interested in such a feature. Some of the test persons said that they were not really the type for competition, but that this was perhaps more true for the younger generation. One test participant, for example said:

> "It's nothing for me personally but I have some friends who would like it. My brother sends me a screenshot of a new highscore every day of a game we both play".

Nevertheless, in the survey of 12 test persons, the leaderboard was only ranked once in first place.

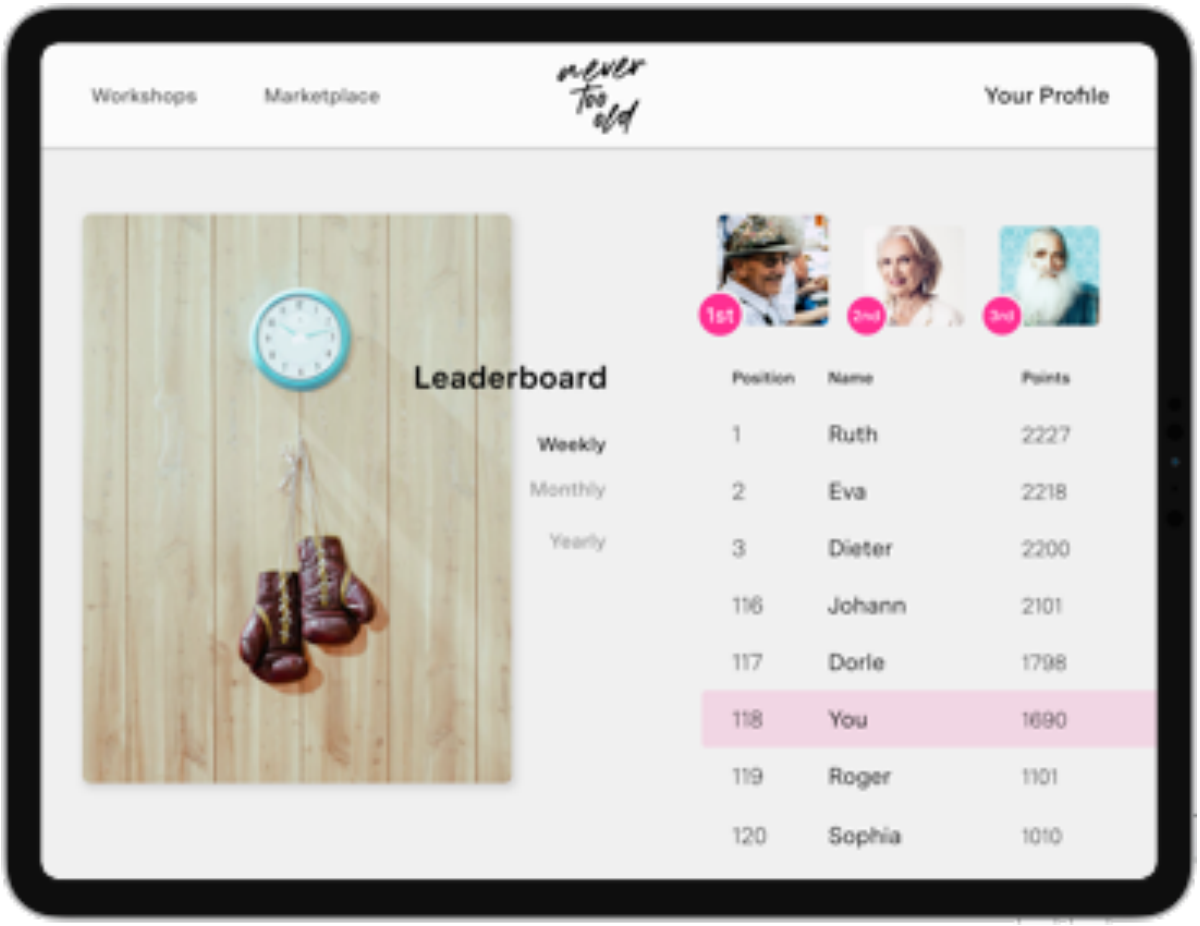

Fig.12 Never too old, concept of leaderboard

6.3.4 TRENDS

The next concept feature, which was presented to the potential users, has been trends. Here users can view current trends in the form of a news feed created by younger generations. Trends were based on the researched Joy-of-Use criteria “stimulation of the intellect” and “curiosity”. The test persons reacted very positively to this element. One test person said: *"for me It is very important to be always up to date, especially in technological areas we can learn a lot from younger people."* It was very interesting that during the presentation of the trend examples, there was immediate interest on the topic. At the end of the presentation a test user even asked, if there were more trends to read. Consequently, it can be said that there was a clear interest from potential users in this category. Trends were based on the researched Joy-of-Use criteria “stimulation of the intellect” and “curiosity”.

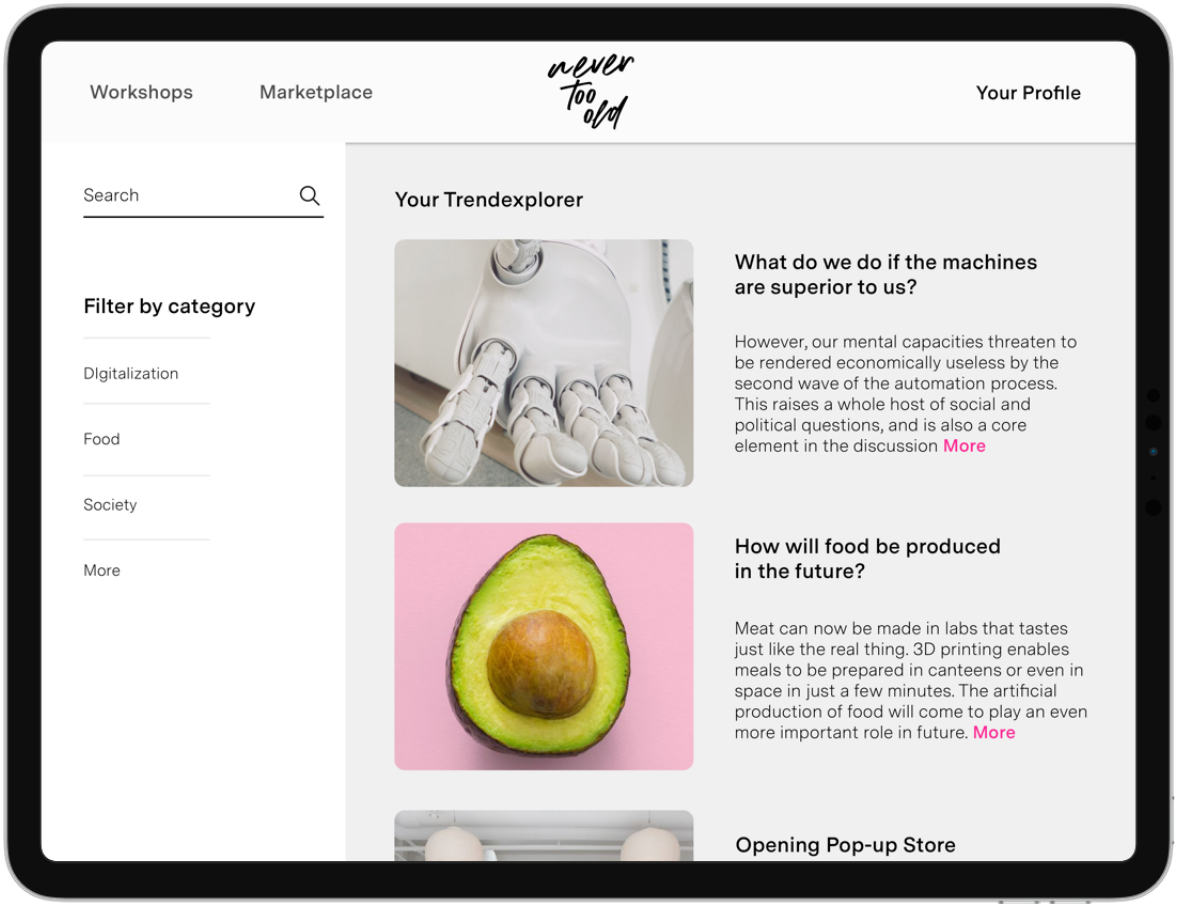

Fig.13 Never too old, concept of trends

6.3.5 PERSONALIZATION

With this concept extension the potential users have the possibility to integrate a little more personality. For example, users have the possibility to add their own profile picture or upload pictures of the workshops they offer. This element was taken for granted by most users but was considered necessary. Only one test participant said during the interview that he would not like to upload a picture of himself. Another test person said that this element was not really exciting, but the most important from their point of view. Personalization was based on the researched Joy-of-Use criteria “identification with the product” and “individualization”.

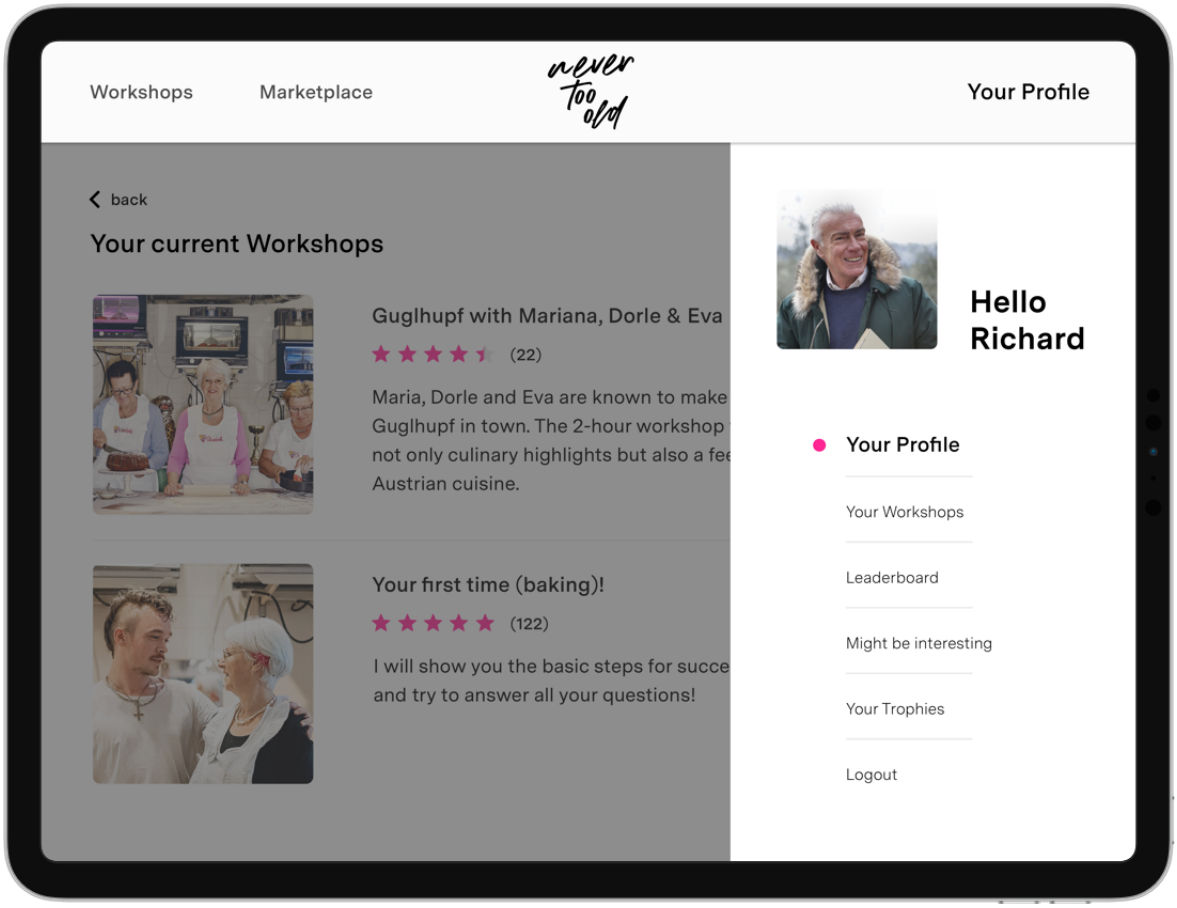

Fig.14 Never too old, concept of personalization

6.3.6 CONTROL CENTER

The sixth and last extension concept to increase Joy-of-Use was the control center. Within this area the potential users have the possibility to see their statistics as for example the total number of given workshops or of participants in their workshops.

This area was perceived as important by the participants. A majority of the respondents consider this area necessary but not very motivating in terms of Joy-of-Use. One respondent said: "This is the most important area for me because here I can always see what I have achieved. The numbers are much more motivating for me than the trophies discussed earlier."

Within the presentation of this concept extension, one test person asked whether the money earned through the workshops could be donated directly to organizations. The control center was based on the researched Joy-of-Use criteria “control over the application”.

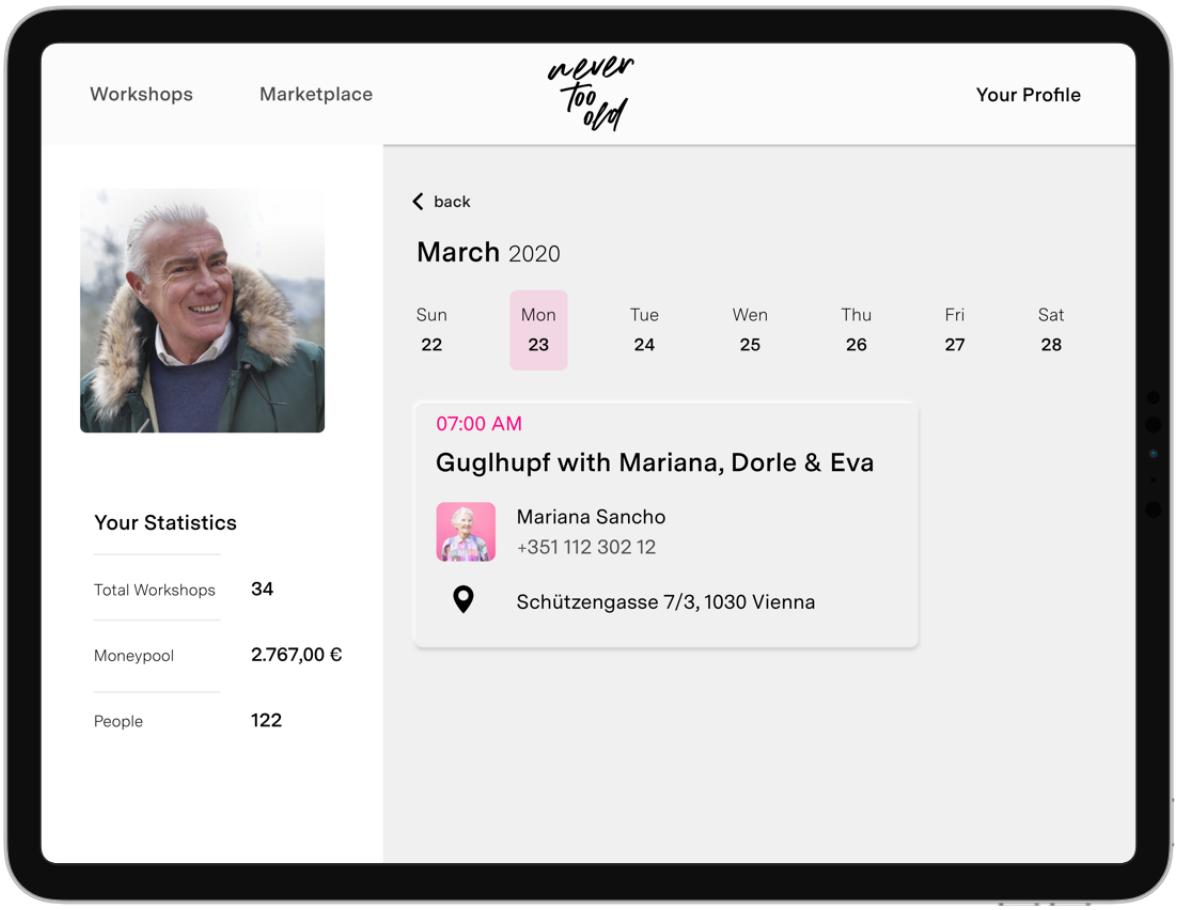

Fig.15 Never too old, concept of control center

6.3.7 RESULTS CONCEPT SORTING

At the end of the concept validation, the test persons were asked to sort the six concepts by popularity in a sequence from 1 to 6 (1- most important to 6- least important) Later, the individual results were matched with points from 6 to 1. For example, if a concept was put on 1, 6 points were added to the concept. If a concept was put on 2, 5 points were added and so on. This system should contribute to the overall analysis. Table 1 shows the results after interviewing 12 people.

Number	**Concept Name**	**Total Points**
1	Reviews	57 Points
2	Trends	52 Points
2	Personalization	52 Points
4	Control Center	43 Points
5	Leaderboard	26 Points
6	Trophies	22 Points

Tab. 1 Results

According to the data, the concepts *trophies* and *leaderboard* have been rated as being of least relevance. Of particular interest is the clarity of the results. Trophies were ranked last or second to last by 10 of the 12 respondents. For Leaderboard this applies to 9 of the 12 answers. The *Control Center* was perceived by the test persons as much more popular then Leaderboard and Trophies, but on average it was ranked only on fourth position. The concept Trends and Personalization have been rated as popular on average. While personalization was taken for granted by many test persons, many test persons found the trends especially exciting. In total, the reviews were rated as the most popular concept extension. In general, there were no significant differences between the sexes.

6.4 RESULTS ATTRAKDIFF

The evaluation of the AttrakDiff questionnaire examined how easy to use and attractive the product was perceived by the test persons (see chapter 6.4.2). As described in the research design chapter 28 word pairs has been queried. The results regarding the word pairs are shown in figure 16.

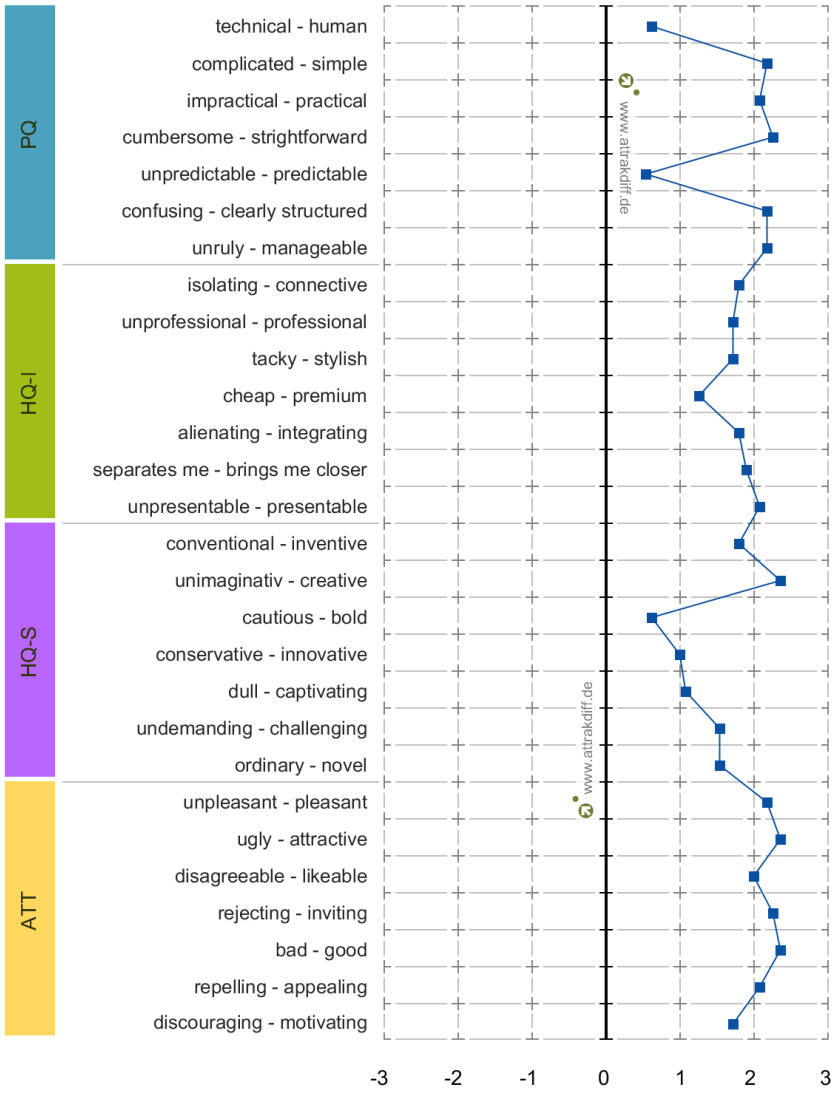

Fig.16 AttrakDiff Results

The individual word pairs enable the identification of the potential weaknesses of the application in detail. In figure 15, Results AttrakDiff, the more negative terms are listed on the left and the positive terms are listed on the right. As can be seen in the graphic, the results regarding the project are completely in positive territory.

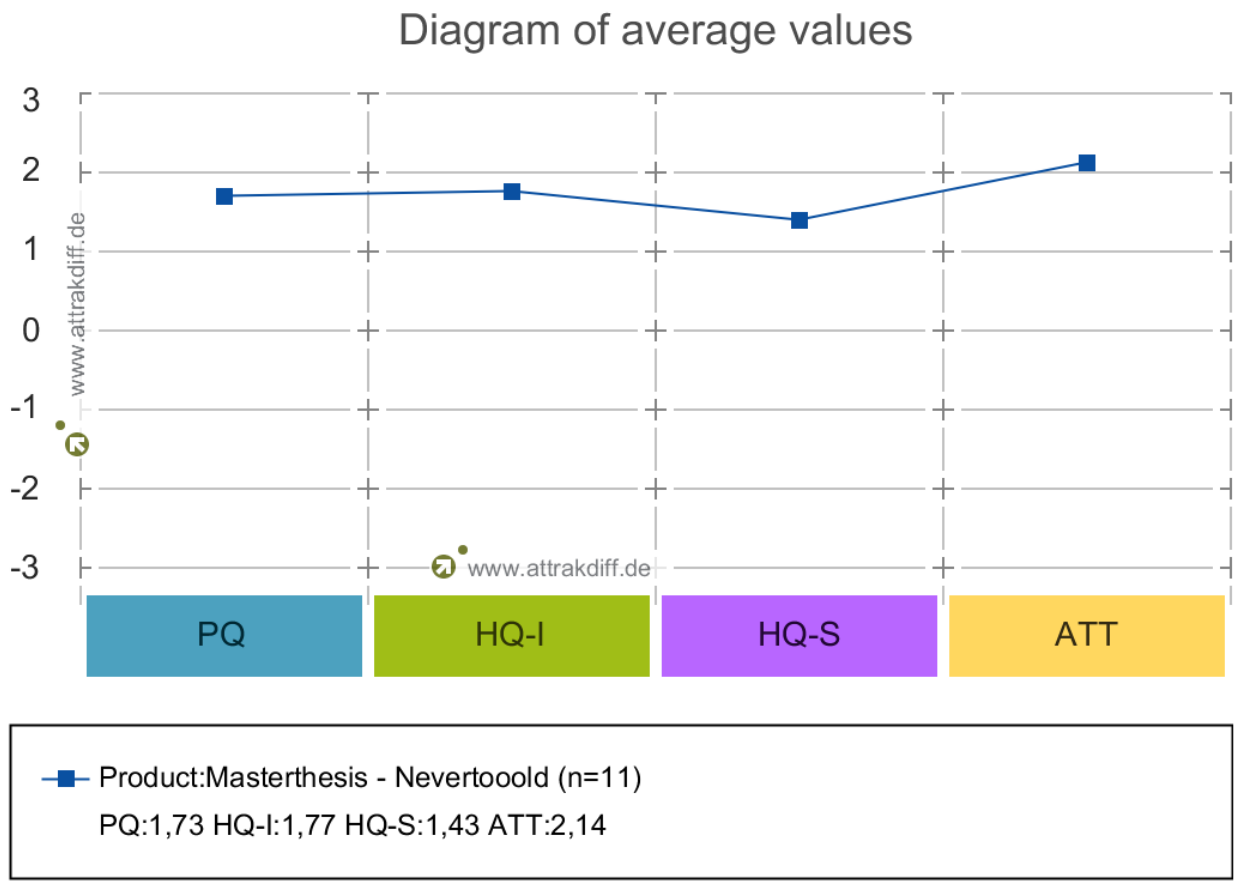

Fig.17 AttrakDiff Results 2

Looking at the four criteria in particular, it is clear that although the results are quite good, there is still room for improvement in some areas. Pragmatic Quality describes for example the usability of the project. When creating the usability, special emphasis was placed on the literature recommendations collected in Chapter 3. Nevertheless, this point should be viewed critically, because pragmatic quality can only be fully evaluated after the application is actually in use. The aspects of hedonistic quality of stimulation and identification as well as the

attractiveness of the system are particularly exciting to consider. These points can also serve as an element of validation of the concept in the earlier development phase. As described in Figure 17, attractiveness in particular has been rated above average. This is also in line with the statements made in the user comments described in Chapter 5. Identification with the product was also rated relatively high, which confirms the existence of the project ”Never-too-old”. The figure shows that the stimulation of the project has potential for improvement. Already in chapter 5 it was found out that stimulation is a very important component in the development of digital products with regard to the target group examined here.

For a general assessment of the product "Never-too-old" the Attrakdiff analysis automatically outputs a figure (18) that displays the classification of the hedonist and pragmatic quality of the assessed product.

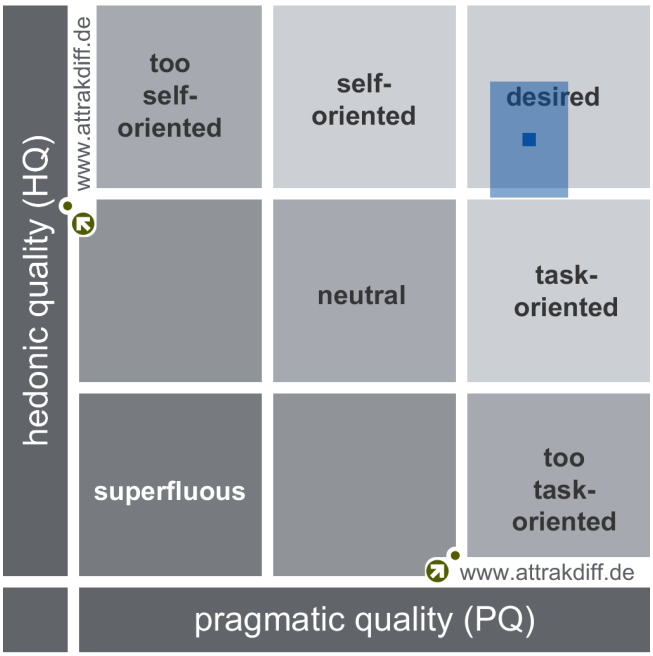

Fig.18 AttrakDiff Results 3

The fact that the confidence rectangle, which is the brighter larger rectangle of the two, is relatively small shows that users share a common opinion on the system. Furthermore, a small confidence rectangle means that the test results are highly homogeneous and deviate little

between respondents. The evaluation also shows that the existing concept of “Never-too-old” can show a relatively high pragmatic as well as hedonistic quality which is highly desirable. Of course, it must be mentioned that the user assessed a yet not fully functional application. However, the data collected here gives a first indication of a successful concept validation, which can be built on in the future.

CHAPTER 7 – CONCLUSION

Within the expert interviews it was already apparent that people over 60 years of age have very different competencies in the use of digital tools. Within the interviews the term inclusive design was critically examined by the experts. A completely inclusive design is simply too complex to be created. Furthermore, inclusive design is not completely within the power of an application. Hardware devices in particular must be specified for complete inclusivity. Inclusive design is therefore an infrastructural issue and hinders the development of general applications. Nevertheless, relevant usability guidelines were described in the thesis in order to design as inclusive as possible with regard to the respective target group. Especially the readability of the content and the interaction with this application play a role in the development. The readability can be achieved by the correct choice of font, the size of the font and a contrast check regarding the color values. At the same time, it is important to ensure that as little content as possible is presented per screen view. In order to guarantee the best possible interaction, it is important to keep a minimum size of buttons and to design the hitzones for interaction with those buttons accordingly large.

An important finding within the expert interviews was the fact that digital communication tools in particular are highly relevant for older people. This fact was also reflected in the primary user tests. Facebook, WhatsApp and tools as Zoom are very popular and are used by almost all the people surveyed. The general digital competence of the people surveyed was rated at about 7 out of 10 points. The fact that so many older people now have a certain level of digital expertise confirms the importance of responding to the needs of older people in a digital context in more depth.

Within the general interviews it was found out that besides readability, the attractiveness of a website is an important factor to increase the Joy-of-Use. Emotionality and minimalistic design have been also considered important within the survey. One test participant commented that there is often too much text on the website and that she usually stops reading after half of the text. The results of the thesis show that not all of the quality criteria for Joy-of-Use found in the literature research are of high relevance for the respective target group. Above all, it can be stated that the quality criterion *challenge* is of minor relevance. This became apparent not only from the general questionnaire but also from the survey on the project "Never-too-old". The criterion *identification with the product* could be analyzed as an important aspect in developing for the respective user group. Another important criterion is the identification with the product or a website. Here, too, the general survey results were confirmed with the practical concept extensions of "Never-too-old". Following the completion of the research design, *Stimulation of the intellect* can be evaluated as the most important criterion after a functioning usability.

8.1 RECOMMENDATIONS FOR ACTIONS REGARDING JOY-OF-USE

This section aims to translate the findings of the study into recommendations for designers that develop for the respective target group. The first question to be answered was described in the beginning of this thesis as follows.

Which criteria for achieving Joy-of-Use must be considered when developing digital applications for older people?

The usability is indeed the foundation for a successful increase of Joy-of-Use. Designers should orientate themselves on existing literature. Besides a clear content strategy is, among other things, the definition of a well readable font and its´ minimum size of 16pt. At the same time, digital contrast tools should be used to guarantee the readability of the content in relation to the background. In addition, the navigation elements should offer the largest possible interaction surface to make it as easy as possible to interact with them.

It is especially important to have a good content strategy, which allows to reduce the content to the most necessary to ensure minimalism and to guarantee the aesthetics of the

website. Through a minimalist design, the important content can be transported more clearly. Therefore, a minimalistic content strategy can also help to increase the usability and especially readability for older target groups. Within the content strategy, the criteria of stimulation of the intellect, identification with the user group and creating curiosity should be considered. These three criteria are particularly relevant for generating Joy-of-Use in the respective user group.

Another finding that designers should consider is the importance of the terminology used when communicating with older target groups. An incorrect use of terms can lead to frustration within the target group and in the worst case can have a significant impact on identification with the product. Terms like old or elderly should therefore be avoided if possible. It is therefore advisable for the communication strategy to work closely with the target group. The integration of challenges, apart from game applications, should be verified carefully with the target group, as the results of the study indicate that this criterion seems to be of less necessity.

The integration of reviews is an important factor but should only be integrated if it is reasonable. In general, however, the integration of social components is considered as important. At the same time the integration of such elements can increase the curiosity of the user. In addition to the reviews, it became apparent that elements such as trends or news adapted to the target group were considered particularly important. Especially the integration of social components as well as the integration of elements that stimulate the intellect can serve as a mediator for increasing curiosity.

A further question within the thesis, which has to be answered, is related to the accompanying project “Never-too-old” and stated as follows.

Which recommendations for action can be given for the project “Never-too-old” with consideration to Joy-of-Use?

After completion of the research design and especially after the discussions with the elderly people, a few recommendations for action became apparent to consider in further development of the project “Never-too-old”. The main points are described within the following section:

(1) Re-Naming: Especially the name of the application was critically commented by some test participants. Although there were also participants who liked the name very much, it would be better to choose a name that does not polarize that much. This change could lead to an increase of identification with the product.

(2) Integration of Social Interaction: The integration of reviews and social interaction components should play a central role in the further development of the project. The

user comments and user profiles (e.g. image or name of the user) should be clearly visible.

(3) Integration of Trends: The integration of elements that lead to the stimulation of the intellect should be a central part of the development. One way to integrate more stimulation elements could also be a kind of home feed as the start page of the application.

(4) Focus on the essential: It was found that features such as the leaderboard or the integration of trophies do not produce a positive impression and are therefore not necessary for implementation.

(5) Integration of a possibility to donate the earnings: This particular aspect was not questioned during the testing. However, the possibility of implementation should be validated in the future.

8.2 LIMITATIONS OF THIS THESIS

This work comes with some limitations which will be discussed below and create space for further research.

One limitation was the fact that the studies had to be conducted via digital channels due to the corona pandemic. Therefore, the observation possibilities of the researcher via Skype and Zoom were limited. As the topic of Joy-of-Use is a very emotional one, the direct analysis of emotions by testing in the same room would have been more complete. Another limitation is the fact that the average age of 65 is relatively young for a general picture of the "older generation". Within the conversations with the 12 test persons, some of them perceived major differences in digital competence and interests. Also, regarding the level of education, not all relevant groups within the study could be considered. Therefore, the results of this study can only be considered as a tendency. A deeper insight can only be achieved by enlarging the test group.

Another limitation is the fact that the application was tested at a very early stage of development. A complete validation of a functioning usability can therefore not be made at this stage. Nevertheless, the results serve as a first assessment for the successful further development of an application.

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