Hedonic and Pragmatic Qualities of AAL Pilot Region Technologies: Evaluation with the AttrakDiff Survey

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Abstract: Uniform structuring, clear presentation, simple navigation - terms that are associated with good usability these days. However, purely pragmatic quality features are often not sufficient to gain an insight into how the product, technologies or software are assessed by the user. In order to be able to evaluate the user experience with the parameter "Joy of Use", hedonic quality features should be taken into account. Pragmatic and hedonic characteristics result in the degree of attractiveness, which plays an essential role in the presented work. Within the Carinthian pilot region Smart VitAALity, the attractiveness of the provided AAL technologies was evaluated with a subsample of ten participants using the AttrakDiff questionnaire as well as interviews. By combining the two methodologies, the system could be assessed without much effort and first impressions of the users could be collected. As the results show, the overall experience was good and positive. However, in general, the interviews showed that there is still room for the improvement of the system.

1 INTRODUCTION

The evaluation of products or software is becoming more and more important in user-centered design driven implementation. Products should be easy to use in order to be able to utilize them in an efficiently, effectively and satisfactorily way for a certain context on the one hand, and to increase technology acceptance and usage behavior on the other. A frequently associated term with this characteristic is usability. Thus, it still plays a crucial role in technology development for senior citizens. Attention must be paid to any restrictions associated with age, since special needs and criteria influence the use of technologies. Older people are sometimes rather reserved when it comes to the use of new technologies (Raymundo et al., 2014). This is why it is especially important to stress which benefits they can gain by using new technologies and services. However, in order to make a product appear particularly attractive, not only the goal and task-oriented orientation but also the joy and enjoyment ("Joy of Use") must be taken into account when using it, since perceived enjoyment is associated with usage behavior and its extent (Igbaria et al., 1994).

Active and Assisted Living (AAL) technologies and services are developed and designed especially for older people and aim to be adapted to the needs of the future users with the aim to support daily activities at home in the best possible way for a longer independent life. In some pilot regions of Austria, AAL systems have been developed and subsequently evaluated in terms of technology acceptance, usability and user behavior. In the Carinthian pilot region Smart VitAALity[1], the evaluation domains should be expanded to consider also the user experience in order to measure the attractiveness of AAL technologies and services in pilot regions for the first time.

The evaluation was based on a one-year test phase in which 102 participants (between 60 and 85 years) in the intervention group used the Smart VitAALity system, consisting of a bundle of technologies and services with the main focus on health management and support of social participation.

[1] Project Smart VitAALity - https://www.smart-vitaality.at/ (04.02.2020)

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2 METHODS

In this chapter the used AttrakDiff survey is explained with the different measured components. Furthermore, the evaluation schedule and participant selection are displayed.

2.1 Qualities

The underlying two-component model of this questionnaire distinguishes between two types of subjective quality perception: pragmatic (PQ) and hedonic (HQ). Human needs for safety, control and trust, which refer to the perceived usefulness of users of interactive products, are described by the pragmatic quality perception. These quality characteristics help to evaluate products or software e.g. as clear, supporting or controllable. HQ, on the other hand, is not a goal-oriented or task-related quality characteristic, but rather emphasizes the human need for curiosity, social comparison and desired identity, e.g. by making the software appear professional, striking, modern, exciting or simply different. However, this quality feature addresses our needs much more directly, because we love beautiful things or want to learn something new (Hassenzahl, Burmester, Koller, 2008). (Burmester et al., 2002)

Both qualities are independent of each other and users can assess them separately (Hassenzahl, Burmester, Koller, 2008). I.e. products with a high pragmatic quality do not necessarily have to have a high hedonic quality. However, it would be desirable if both quality features were equally pronounced in a product or software (Hassenzahl, et al., 2003).

The attractiveness as an overall assessment can be formed from both quality characteristics. An attractiveness judgement corresponds in the true sense of the word to a global subjective emotional categorization between good or bad. For a user, the opinion on the attractiveness of a product or software is made within seconds, a decision from the heart without thinking about the word as such, and depends on the situation in which the particular software is used. It is assumed that pragmatic or hedonic perceptions remain relatively stable in different situations, although the global evaluation can still change and is more likely to be formed situational. (Hassenzahl, et al., 2003)

The model itself separates three essential aspects, as shown in figure 1.

Objective Product Quality: When creating a product or software, the designer aims at a certain product quality, formed by pragmatic and hedonic features. For example, the decision of designing a clear layout (PQ) to make the product look professional (HQ).

Subjective Quality Perception and Evaluation: The quality is perceived by the user and evaluated on this basis. Perceived pragmatic and hedonic quality is summarized within the evaluation as attractiveness.

Behavioral and Emotional Consequences: The evaluation ultimately leads to two possible consequences. On the one hand, the evaluated attractiveness influences the behavior or the handling of the software, such as avoidance or increased use. On the other hand, the emotional consequence is expressed by emotions such as joy, satisfaction or anger.

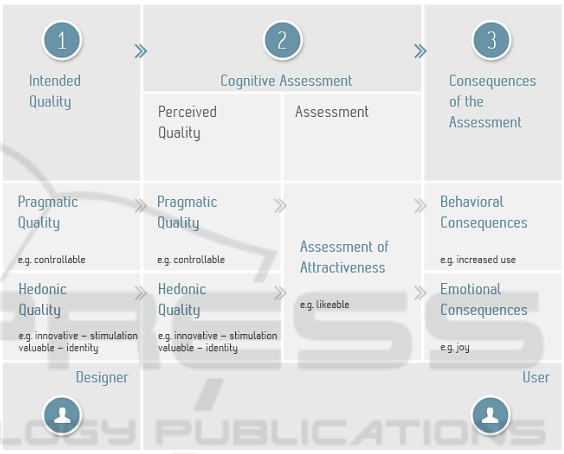

Figure 1: Basic model[2] of the AttrakDiff questionnaire - Interaction of hedonic and pragmatic quality.

2.2 AttrakDiff

In order to assess the attractiveness of Smart VitAALity technologies and services, the AttrakDiff2 questionnaire (Hassenzahl, et al., 2003), which is based on the two-component model of pragmatic and hedonic subjective quality perception, was used as a measuring instrument. For the assessment of the HQ, the questionnaire focused on the two dimensions stimulation and identity. The questionnaire belongs to the class of semantic differentials and is used to record attractiveness as an overall assessment in a standardized way. For this purpose, 28 bipolar items with seven gradations are mapped. The total number of items is again summarized in four scales, each with seven items and therefore the respective mean is calculated. A distinction is made between PQ,

[2] AttrakDiff Sience - www.attrakdiff.de (04.02.2020)

hedonic quality stimulation (HQ-S), hedonic quality identity (HQ-I) and attractiveness (ATT).

PQ: When using the product or software, action objectives should be provided by useful and usable functions.

HQ-S: This category focuses on the need to improve one's own knowledge and skills as well as natural curiosity.

HQ-I: This includes the communication of relevant other self-serving messages.

ATT: Is the global positive or negative evaluation of a product or software, such as good or bad.

The questionnaire was empirically tested in a pilot study and can be used online free of charge since 2002. For the survey of the attractiveness of Smart VitAALity, the selected participants filled out the questionnaire on paper. For the evaluation, the AttrakDiff[3] Online Tool was used.

2.3 Evaluation of UX and Integration in Daily Routine

The Smart VitAALity System was evaluated in the four domains subjective quality of life, socio-economical potential analysis, usage frequency as well as acceptance with user experience as one essential influencing factor, and effects on integration in daily routine (Oberzaucher, et al., 2020) Within acceptance studies, additional to a survey of the whole intervention group, the UX questionnaire AttrakDiff as well as interviews have been conducted (Krainer, et al., 2020).

To gain a first idea about the user experience, usability and usage opinions, persons have been interviewed with a pre-defined interview guide and the AttrakDiff survey.

The evaluation of the interviews was based on the method of content structuring (qualitative content analysis) according to Mayring (Mayring, 2010).

2.3.1 User Selection

To get a sample out of the Smart VitAALity participants it was necessary to have a look at the categories the people are in. For the project the main categories sex, age, geographical location, Care Center membership and the usage behavior were relevant. Each of them got an internal ranking, how important it is for the selection of the ten participants of the UX analysis and interviews. Most important were the Care Center membership and the usage behavior; the Care Center membership, because some questions in the interview guide were directly related to that function and the usage behavior, because it should reflect the variety of users as in the project at that time. As shown in table 1 there were some differences regarding the distribution of the main categories to the total participant group of Smart VitAALity. An example is the main category age, it was not possible to get people out of the age group 55-64 years for the interview. This fact was tolerated, because the category age was previously weighted as secondary. This means for the user selection it is less important, because it is not directly related to the usage behavior – as pre-evaluation showed.

Table 1: Distribution of the interview participants compared to the total Smart VitAALity distribution.

Main Category (weighting)	Sub-Category	Interview	Total
total	total	10 (100%)	102 (100%)
sex (secondary)	w	6 (60%)	68 (66.6%)
	m	4 (40%)	34 (33.3%)
age (secondary)	55-64	0 (0%)	30 (29.4%)
	65-74	6 (60%)	46 (45.1%)
	75-80	4 (40%)	26 (25.5%)
geographical location (secondary)	Klagenfurt	3 (30%)	48 (47%)
	Villach	4 (40%)	32 (31.4%)
	Ferlach	3 (30%)	22 (21.6%)
Care Center membership (primary)	yes	6 (60%)	69 (67.6%)
	no	4 (40%)	33 (32.4%)
usage behavior (primary)	High usage	5 (50%)	30 (29.4%)
	Moderate usage	3 (30%)	54 (52.9%)
	Low usage	2 (20%)	18 (17.6%)

2.3.2 UX Analysis and Interview Schedule

Before starting with the questionnaire and the interview, the participants had to sign an informed consent to agree with the processing of the gathered

[3] AttrakDiff Online Tool - www.attrakdiff.de (04.02.2020)

data and, furthermore, that they allow to audio record the interview. Then the one-hour session started with the AttrakDiff survey. The participants were instructed to choose between the word-pairs what they think will fit the best for them. They should not think about it too long. On average, they needed 107.8 seconds to fulfill the survey on their own. Afterwards the recording started and the interview part began. The interview guide contains questions to describe daily situations with Smart VitAALity, usage, handling and some ranking of particular services e.g. the Care Center. In total, the interview session lasted about one hour.

3 RESULTS

In the following subchapters the results of the AttrakDiff evaluation of the pilot region Smart VitAALity is shown. The evaluation was done in November 2018, five months after the participants got their technologies.

3.1 Portfolio of Results

The results of the AttrakDiff survey of Smart VitAALity is first shown in figure 2 in the graphical representation of the confidence rectangle (light blue rectangle) and the medium value (tiny dark blue rectangle). The Portfolio view displays on the vertical axis the hedonic quality and on the horizontal axis the pragmatic quality. Depending on the answers / dimension values the blue rectangle, that represents the rating of the product / technologies, lies in one or more character regions – as in figure 2, it lies over four regions, self-oriented, desired, neutral and task-oriented. If the confidence rectangle is small the investigation results are more valid and less coincidental. Bigger rectangles are less significant and it is not possible to assign them to a certain region (e.g. self-oriented).

Furthermore, if the confidence rectangle is bigger it means, that the evaluation ratings of each participant are very different and there is no unambiguous opinion. (Hassenzahl, et al., 2003). As shown in figure 2, the result shows a relatively small confidence rectangle with a little more spreading at the PQ, which indicates that the participants were more divided in PQ. It is located in kind a natural position with a slightly tendency to self-oriented but has no extrema into “too self-oriented” or “too task-oriented”, which is positive. Overall, the participants think, it is more self-oriented than task-oriented. Assistive technology should support during daily living and not burden the users with further tasks that could be hard to do. Furthermore, the confidence rectangle shows that the feeling is slightly more neutral than the participants really desired such technology. Often people think that elderly people are afraid of state of the art assistive technologies (Raymundo et al., 2014) but this result reflects that they are in a neutral rather positive (desired) mood. According to the shape of the confidence rectangle it can be said, that the Smart VitAALity system has more hedonic than pragmatic quality.

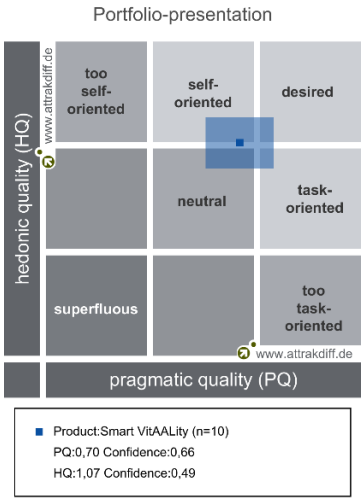

Figure 2: AttrakDiff evaluation result: Portfolio-presentation.

3.2 Diagram of Average Values

The diagram of average values represented in figure 3 shows that the Smart VitAALity technologies and services are attractive for the users. (Hassenzahl, et al., 2003) Furthermore, the hedonic quality is differentiated into the two parts identity (HQ-I) and stimulation (HQ-S). Both factors are nearly on the same value and are relatively high (HQ-I = 1, HQ-S = 1.1). On the one hand, that means that the technologies and services help the user empower themselves in their own development because it provides e.g. interesting functionalities. On the other hand, the HQ-I value shows that the users can identify themselves with Smart VitAALity, so they do not feel any shame of using such technologies and services.

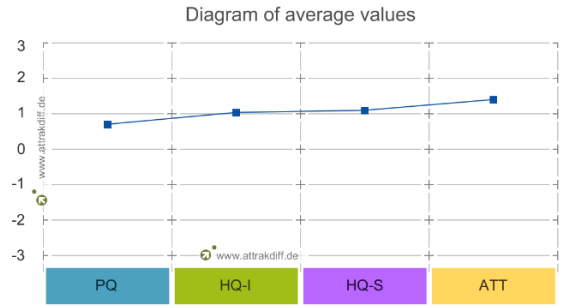

Figure 3: AttrakDiff evaluation result: Diagram of average values.

As mentioned in the description of the portfolio-presentation (figure 2) the PQ is slightly lower (0.7) than the HQ (1.07) but it is still in the positive sector as shown in figure 3. Furthermore, it depends on the fact, that Smart VitAALity is a prototype (market readiness level 6-7), which is tested in a field study. Efficiency and effectiveness should be improved when the products are on the market, in the first run, the aim of the project was that the technologies and services are running stable. All three qualities together lead to the attractiveness level of 1.41, which represents the statement, that Smart VitAALity is attractive for the users with some room for improvement.

3.3 Description of Word-pairs

In figure 4, the mean values of the word-pairs are presented. This shows a deeper level of the evaluation, which means, that here not just the upper categories PQ, HG-I, HQ-S and ATT are represented, but also the word-pair level. Extreme values show whichcharacteristics are particularly critical or particularly well-resolved (Hassenzahl et al., 2003). Furthermore, the standard deviation is shown (light blue bar). This additional value provides the information on the scattering of the answers.

The results show that just one parameter is in front of the neutral line (0) and is thus some kind of negative - the word-pair “technical – human” (-0.2 in the ranking) is not an extreme value but the only negative evaluated word-pair. For the project Smart VitAALity it was an expected value for two reasons: the participants are not used to such assistive systems and, therefore, they categorize it as more technical. Secondly, Smart VitAALity was introduced as technical system to support the daily living of the participants. The word-pair “unprofessional – professional” (0.2 in the ranking) indicates that Smart VitAALity is a prototype and not a finished product.

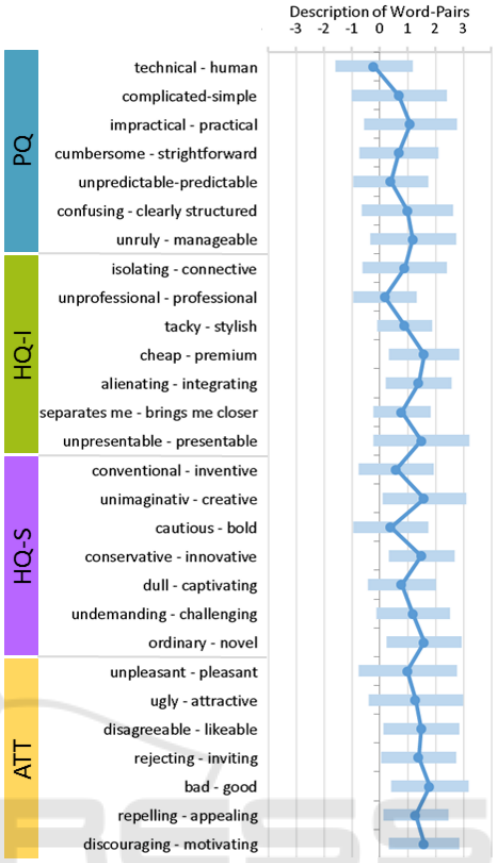

Figure 4: AttrakDiff evaluation result: Description of word-pairs.

Therefore, of course it seems to be not as professional as the users expected it to be.

Especially the result for the word-pair “unpredictable – predictable” (0.4 in the ranking) has to be considered as noticeable. Assistive systems for seniors have the aim to work in a way that no surprises come up for the users. That means they should know after some time of usage what to expect from the system and how it works. On the one hand, maybe the users connected this word-pair with the issue, that especially in the beginning of the test phase some problems and errors occur. On the other hand, it cannot be ruled out, that there are unpredictable features in the software that should be avoided.

The word-pair “bad-good” was mainly chosen in a very positive way (1.8 in the ranking) and is after the word-pairs “cheap-premium”, “unimaginative-creative”, “ordinary-novel”, all three with 1.6 in the ranking and “conservative-innovative” with 1.5 in the ranking the most positive pair. All of them represent that Smart VitAALity is a new, innovative and overall good selection of technologies, functions and services.

3.4 Results Interviews

In the qualitative interviews, participants reported about positive feelings caused by the Smart VitAALity system and integration in the daily life, that underlines the hedonistic quality.

P08: "I often thought about it and it is actually very pleasant. You also prepared it very well with the tablet and the whole thing"

P03: "I am happy that I can participate as a test person, probably the oldest one in the study"

P01: "The first thing in the morning is I measure my weight and blood pressure. That's always the same before I get dressed."

Participants reflected the pragmatic quality in the interviews in both ways – positive and negative.

P03: "The most important for me is to check on my health data"

P06: "I would like to use it but it seems so inconvenient"

Not all of the participants agreed with the premium look of the Smart VitAALity system like a quote about the smartwatch shows.

P07: „It is not much to look at. It's pretty chunky"

The issue with the unpredictability of the system reflects in following statement of an interview participant.

P01: „I have to say, I often walk around with my watch for half a day before I notice that it doesn't count my steps at all"

One participant gives insights into her preference to rather have a human person for support than a technical product.

P06: "Of course I still prefer a human being because I can simply communicate better this way"

The quotations of interview participants are originally in German and were translated for this paper. The original quotes can be found in (Krainer, et al., 2020).

4 CONCLUSIONS

The AttrakDiff survey as well as the qualitative interviews were realized to get an atmospheric picture from the Smart VitAALity participants about their experience with the system.

As the results displayed, the overall experience is positive, both the pragmatic and hedonic quality are ranked positively. This indicates that the participants of Smart VitAALity could reach their goals with the system in an efficient and effective way as well as they felt a joy in using the technologies and services.

The Smart VitAALity system was tested in the project on a market readiness level of 6-7, which means, that is a prototype. Therefore, of course, during the testing phase problems, errors and misconduct of the system occurs. This can lead to the fact, that the results of the AttrakDiff and the quotes of the participants show a clear tendency for room of improvement. The system should have a more professional look and feel if it will be developed to a market ready product. As a matter of course, it is important to improve the system according to the predictability. As one of user experience principles foreseeability is characteristic for good usability. Users should always know where they are, how they get there, what they can do and how to go back in a system. The evaluation result of 0.4 was just slightly positive and, therefore, it should get more attention to optimize the overall user experience.

Collectively said, Smart VitAALity was ranked as good which is reflected in the results; on the one hand shown in the word-pair ranking good-bad and on the other hand on the category results of PQ and HQ. It may be sometimes to technical for the participants, because of the non-experience in using technical support systems or other reasons, but the combination of human-driven and technology-driven aspects lead to an accepted and joyful system that help people doing their tasks efficiently.

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