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Miles apart but close at heart?

Exploration of UX checklist for relatedness technologies based on focus groups

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Abstract: With more people living physically separated from beloved ones, technologies which support relatedness over distance can play an important role for wellbeing. For this purpose, these so-called relatedness technologies use different strategies such as awareness of the other's activities, simulating physical proximity, or joint action. It appears that only few research concepts turn into commercial concepts or are actually adopted in everyday life. Also, published concepts often show a lack of theoretical foundations and systematic exploration of relevant factors for acceptance and user experience. The present research aims to provide a better theoretical basis for the research and development of relatedness technologies by combining theory from psychology and HCI with empirical insights from four focus groups ($n = 21$). As a result, we present a UX factors-checklist consisting of motivators, hygiene factors, and meta topics that can be used when designing and evaluating relatedness technologies in order to ensure actual use and a positive user experience and highlight next research steps.

Keywords: relatedness technologies; user experience; focus group interviews; motivators; hygiene factors; design

1 Introduction

In the past years, human-computer interaction (HCI) researchers suggested a variety of technologies and concepts beyond traditional communication that create a sense of relatedness over distance, with the aim to enrich relationships of people who are apart from each other (e.g.,

[1–3]). In contrast to establishing relatedness by classical means of communication such as a telephone call (which of course can also serve other purposes such as informational needs or simply ordering a pizza), so-called relatedness technologies specifically aim at fulfilling the psychological need of relatedness and belonging, by different strategies (see [4]).

These kinds of technologies have gained attention over the past years – not only because of the pandemic, being separated from our loved ones has become increasingly common. People tend to move out at an earlier age due to work opportunities or education [5], long-distance relationships are on the rise [6] and the older generation leaves their environment to live in retirement homes [7]. While being apart from beloved ones, feeling close to each other can pose challenges. If basic needs as relatedness and belongingness (e.g., [8, 9]) are not adequately met, people suffer both mentally and physically (e.g., [10, 11]). Feeling lonely, isolated and not feeling related is associated with several negative health issues such as cardiovascular diseases, decreased cognitive performance, depressive symptoms, anxiety as well as overall less optimism and self-esteem (e.g., [10, 11]). In work-related contexts loneliness is associated with poorer task, team role and relational performance and organizational commitment (e.g., [12, 13]). Otherwise, feeling connected to one's coworkers can positively influence the perceived job satisfaction [14]. Furthermore, research shows that people who are more content with the relationships in their life are happier than to those who are not (e.g., [15–18]). Despite the availability of various relatedness technologies, only a few are widely adopted and successfully integrated into everyday life. Considering their general potential to increase wellbeing and fulfilment of relatedness needs as well as the increasing number of situations of physical separation, an examination of factors leading to their acceptance can be helpful. These insights are especially relevant for designers and developers to ensure actual usage as well as a long-term positive user experience.

1.1 Research goals and contributions

The objective of this paper is to offer a more proficient theoretical basis on how relatedness technologies need to be designed to make users accept and want to use a product. It

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provides comprehensive insides about noteworthy aspects from the perspective of different target groups.

A large number of psychological theories and research deals with relatedness, its facets, triggers and consequences. However, this knowledge is rarely transferred to the context of technologies and used during their development. Thus, this paper reveals and links underlying thoughts, needs and views that should be considered in the creation of such products as well as design implications that call for further systematic investigation.

In the following, first, theoretical approaches and previous findings related to relatedness as well as the acceptance of technologies are presented. Based on this, initial assumptions about relevant user experience (UX) factors for the acceptance of such technologies are proposed that serve as a starting point for the subsequent empirical investigation. Second, an explorative qualitative research study conducted with four different focus groups is described, which highlights different types of relevant UX factors as well as more general insights for design and evaluation. Last, findings from the focus groups are classified and linked with previous literature. Resulting limitations and further research directions are discussed.

2 Related work

Relatedness technologies can enrich relationships of people who live far apart, by extending existing technological communication devices through e.g., visual, haptic, or acoustic dimensions. However, when implementing technological innovations, it is important to consider potential users' needs and factors contributing to the acceptance of the technology [19, 20]. In this regard, the following section provides an overview of existing models and theories concerning the concept of relatedness as well as technology acceptance. In the specific case of technologies that create relatedness, going beyond a utilitarian use of technological devices, there are different aspects that need to be considered concerning the intimate nature of communication. Therefore, relevant UX factors for relatedness technologies are proposed in the following.

2.1 Relatedness

A variety of psychological theories on the basis of motivation and behavior include relatedness or belongingness as a central factor that influences people and is essential for well-being. Based on multiple psychological theories this need can be described as “the feeling of having

regular intimate contact with people who care about you rather than feeling lonely and uncared for” [21, p. 339]. For example, Maslow [22] saw the fulfilment of relatedness needs as crucial for flourishing motivation. Ryan and Deci [9, 23] also emphasized the importance of relatedness in their Self Determination Theory (SDT), in which they proposed three initial psychological needs, including the factor relatedness next to autonomy and competence. Depending on the type of relationship, relatedness can come in different forms and needs as well as expectations to be met in order to feel loved or connected (e.g., [24]) and relationships can be characterized according to various aspects [25–27]. Moreover, the performed behaviors to feel close to each other can differ in their universality and occurrence in daily routines [28–31]. Due to these significant differences between types of relationships and how they are practiced, we suggest that it is crucial to take the individual fit of a technology to the respective relationship into account as a relevant UX factor when designing relatedness technologies. However, one behavior that can be seen at the very core of all relationships and is crucial for their development is self-disclosure – the revealing and sharing of intimate information. Therefore, we also suggest confidentiality as an important factor to be considered when designing such technologies. Furthermore, the need for belonging is to be distinguished from mere social interactions someone could also experience with strangers, as it is associated with the belief that the counterpart cares about and likes one in the same way – so that the feelings one has are reciprocal [8]. Hence, we also suggest considering the consequences of violated reciprocity as a relevant acceptance factor.

2.2 Conceptualizations of technology acceptance and user experience

So far, no universally valid definition of technology acceptance can be found in the literature. While in some cases acceptance is described as the actual use of a technology [32], it is otherwise defined as the intention to use it [33]. Regarding the usage of certain technologies in private environments the definition of the intention to use has been found to be more suitable [34]. Thus, we define acceptance as the intention to use a technology.

Many well-known models that deal with the acceptance of technologies such as, for example, the Technology Acceptance Model (TAM) by Davis [32] focus on utilitarian aspects of the technologies. However, technologies also have other purposes that are not solely utilitarian – like creating the feeling of relatedness. These aspects are considered hedonic

qualities and refer to non-goal-oriented qualities that are not necessarily directly associated with the fulfillment of a task but still pose important determinants of accepting a technology [35]. Hassenzahl et al. [36, 37] developed a two-component model for the evaluation and usage behavior of a product in order to gain more insight into user experience. In this model, hedonic usefulness and pragmatic usefulness are separated as two different qualities and thus non-task-related needs are also considered as relevant factors for the acceptance of technologies. In further theoretical approaches concerning the perception of innovative technologies, different hedonic factors have been picked up by researchers and were integrated into their proposed models. Contexts were e.g., Nintendo Wii [38] or virtual reality (VR) games [39–41]. One factor that emerged specifically in the context of technologies used for communication or the exchange of information like messengers, video chat systems or social networks, was the trustworthiness of the technology and that one can feel safe while using it [42, 43]. As this is especially relevant for all relatedness technologies, we also propose trustworthiness as a UX factor.

Concerning the development of relatedness technologies, Hassenzahl et al. [4] provided initial psychological assumptions that should be taken into account. This includes privacy and controllability issues when a technology requires self-disclosure as well as reciprocity regarding the use of the technology in order to generate more satisfaction among the users. The feeling of intimacy has furthermore been investigated by Janssen et al. [44] by applying principles from affective computing on connectedness devices. Therefore, they also highlight the importance of self-disclosure and the accompanying privacy issues in order to feel intimacy as well as the contrary effects when the behavior is not reciprocal or automated. Other factors that emerged during the process of designing and testing such technologies were again privacy along with user control or autonomy [45, 1] and an easy and seamless integration of the system [46–49]. These findings further support the importance of the factors confidentiality, reciprocity, and trustworthiness as proposed above. The technologies considered here ranged from always-on videos at home [46] communication systems (e.g., text messaging, video conference systems; [49]) or awareness technologies [47, 48]. For privacy-relevant technologies, Distler et al. [50] also point out that context-related factors should be examined as well as users' needs such as autonomy and control, that can provide additional insights on the intention to use a technology [50, 51]. Therefore, we additionally propose to

consider the context and location of use as an important UX factor in the design of relatedness technologies. Furthermore, automaticity of communication, such as automatic communicated emotions and responds, leads to a decrease of felt intimacy [44] which is why, lastly, we also propose conveying intentionality to be important during the design process. Nevertheless, when it comes to technologies that fulfil needs such as relatedness, there is a lack of a more thorough insight on factors that play a role in their acceptance [52].

2.3 Initial list of UX factors for relatedness technologies

All in all, based on the related work on relatedness and previous UX concepts, the following initial higher-level factors and corresponding working definitions are proposed that provide the basis for the subsequent focus group interviews. As all these factors play a significant role in either the context of relatedness itself or corresponding technologies, taking these into account when designing relatedness technologies could lead to a higher acceptance of such.

- **Confidentiality**
Control over who knows what and when about someone, and the level of detail.
- **Context of use**
(Social) context and location where the technology is intended to be used and implemented.
- **Reciprocity**
Extent to generate the feeling of rejection due to a usage imbalance among the users.
- **Individual fit**
Extent to which the technology aligns with the needs of the users' relationship and allows for adopting its use and functionalities as one's own (e.g., regarding interpretation of functions).
- **Trustworthiness**
Extent of sense of security and well-being, or absence of shame, when using the technology.
- **Intentionality (vs. automatism)**
Active, conscious usage and response behavior of the technology (as opposed to automatically generated responses from it).

3 Focus groups

We collected opinions and experiences from the central target groups of relatedness technologies (i.e., families, friends,

relationships and colleagues) as proposed by previous literature. A total of four focus group interviews were conducted, each comprising between four to six participants.

3.1 Participants

Participants were recruited through different systems and newsletters and did not know each other to ensure an open atmosphere during discussion. The prerequisite for participation was to be over 18 years of age and to be assignable to one of the listed categories. An overview is given below (Table 1).

3.2 Procedure

The study was approved by the ethics committee of the university and participation was compensated with 15 EUR lasting between 60 and 75 min each. Participants were told that the subject of interest was their opinion on interactive technologies. The procedure was the same in both cases, the onsite focus groups and the ones conducted via Zoom. The focus groups were conducted by two moderators who followed a semi-structured guideline and were opened with a general welcome and insight into the process, followed by different stimuli and points of discussion.

- Relatedness reports. Participants were asked to briefly describe how they create feelings of relatedness in their respective groups when they are actually together.
- Brainstorming UX factors for acceptance. Participants were shown three different product ideas. Each of them was supposed to depict a different kind of relatedness-generating strategy derived from the review by Hasenzahl et al. [4] and covered the most common strategies used in relatedness technologies. These were: awareness (sharing information about current activities), expressivity (expressing a thought or emotion),

and joint action (doing something together). At first, it was only indicated what the product does (e.g., “Imagine a technology that allows you to know what one of your friends is currently doing or where they are, and vice versa.”) without explicitly explaining and showing a specific product. The guiding questions of the discussion were the following: “What needs to be considered in the design of such a product for you to want to use it? What requirements would have to be met? What would tend to discourage and prevent you from using the product?”

- Discussing existing product ideas. When no further input was generated by the participants or they struggled with imagining the described product, the concrete product ideas for the respective category were presented. Regarding awareness, the exemplary products were a video projection of the other person’s home for when they are at home and a light that varies in brightness depending on how far they are away from it. The video projection product was replaced by a radio that allows listening to colleagues while working in the colleagues group. The example product for expressivity was a wristband that lights up whenever a person triggers it and a stuffed animal that becomes warm when touched. The stuffed animal was replaced by a cube in the colleagues group. Regarding joint action, the exemplary product was VR goggles where one can see a representation of the other person or even physically feel each other through specific textiles and meet in the same location.
- Acceptance factors. Participants were presented with the pre-identified UX factors from the literature review as listed in Section 2.3 one by one with their working definitions. Participants discussed the personal relevance of these factors and compared them with the previously mentioned aspects.

Table 1: Overview of the participants and inclusion criteria.

Group	Inclusion criteria	Sample size (n)	Gender	Age range	Interview format
Family	Having close family (parents, grandparents, siblings, or children) who do not live in the same city as they do	5	3 female, 2 male	21–44	In person
Friends	Having close friends who do not live in the same city as they do	6	4 female, 2 male	24–63	In person
Relationships	Being in a long-distance relationship at the time of the focus group	4	3 female, 1 male	24–27	Via zoom
Colleagues	Working regularly (at least 1 day a week) from the home office or remotely.	6	4 female, 2 male	23–27	Via zoom

3.3 Data analysis

The focus group interviews were recorded and transcribed verbatim. The interviews were originally conducted in German language. Transcripts were translated into English without paraphrasing. For the analysis, a narrative inquiry approach [53, 54] was followed, whereby in a first step individual relevant statements of the respective participants were marked. In a second step, these statements were summarized on superordinate levels within the group. The clustered findings from each focus group were then compared with each other and aggregated to semantic uniform aspects that best possibly describe and contain all the facets mentioned on group and individual level. The proposed factors from the literature review thereby also served as loose guidelines. The additionally identified factors were compared to the ones initially proposed and adapted, added or removed accordingly.

4 Results

The UX factors that emerged during the focus group could be divided into different categories. The dual-factor theory by Herzberg [55] – originally proposed for work contexts – seemed to be a good fit for the declaration of the discovered UX factors: some factors represent motivators, i.e., factors that are essential for generating relatedness and ensuring that a positive experience is created during use. Other factors can rather be seen as hygiene factors, i.e., factors that take possible obstacles to use into account. These describe the requirements for people to engage with the technology and prevent a negative experience. The third category comprised meta topics: overarching considerations for categorizing and justifying the existence of relatedness technologies.

4.1 Motivators

4.1.1 Individual fit

The participants stated how the demands placed on the technology in terms of how it functions depended strongly on the relationship to the other person. This could be observed not only at the group level, but also within the group and for each participant in relation to the person with whom they wanted to use it. In the family and colleagues groups, this came across particularly strongly. Here, according to the participants, the relationships and associated needs in terms of functions seemed to vary the most: the desired functionalities and features to use the technology were,

for example, significantly different between siblings and grandparents or close colleagues and supervisors: “I think for me it would depend a lot on which family member I would be using it with.” (P3) For siblings and close colleagues more intimate and less formal functions would be desired including humorous aspects. Accordingly, participants said that in order to use the technology, it would be fundamental that they could tailor the modes of functioning to the other person: “It would be important to me that it is individualized, so not just the same 10 emojis, but for example a small picture that also fits specifically to the person.” (P6) They further expressed how depending on the relationship, the degree of personalization is also important, as well as how specific the signal one triggers is in its meaning. Especially in the colleagues group, participants were worried about possible misinterpretations of the triggers when one is in a (hierarchical) working relationship and might even be interpreted as harassment, e.g., considering the “I think of you” product: “I think it could be understood as a bad flirt if I don’t specify the meaning and easily be misinterpreted.” (P21) In the same course, it was mentioned that the intensity and strength of the behavior shown should be adaptable to the other person but also to the situation. A comparison that was drawn several times was the variety of emojis and their meaning that one is used to from using smartphones and computers. The strong personalization and customization would, according to the participants, help to depict the relationship between users more realistically and genuinely, which would reinforce the feeling of relatedness and thus also their will to use the product: “I think you can definitely reach a much more personal level using the gadget through such individualization.” (P1) This is further covered in the following UX factor *realness*.

4.1.2 Realness

An additional factor that has emerged is perceived *realness* in use. Participants stated that the information or function that one triggers through the technology should be able to convey the actual thought and intention that they want to communicate to the other person. According to participants, this includes expressing a range of emotions beyond explicit positive points (“I’m thinking of you”): “Sometimes when I have a really bad day I also just think of my friend and want her to know about that.” (P8) Especially regarding the VR product, an important requirement for them was to feel real, and in addition to pure images, interpersonal components, such as charisma, need to be transferred for the feeling of connection and intention to use: “It would be important that it doesn’t just feel like avatars, but really

like the actual person.” (P10) Regarding the VR product, this was said to be more important than being able to provide any special activities: the situations the participants came up with for the intended use were mostly spending time together in ways they would do in real life – eating together, having a chat, playing card games. In summary, participants indicated that their intention to use is higher if they have the impression that the technology reflects what constitutes relatedness for them as realistically and genuinely as possible: “It would be important in order to feel even more connected, that everything is just super realistic.” (P17) Furthermore, the aspect of *realness* is also reflected in a temporal component covered under the following factor *immediacy*.

4.1.3 Immediacy

This factor can be seen as a relatedness-specific facet of the classic “ease of use” acceptance factor as it can be realized by quick and easy handling. Across all the focus groups, it was expressed that *immediacy* is an elementary factor. The participants wanted to be able to send the impulse to feel connected to the other person at the very moment they feel it even if it comes across them randomly throughout their day: “It must really feel like it is live, as if one was actually in that moment.” (P18) There was great agreement that the technology had to be easy to use, especially in the sense of quick handling, in order to be able to give the impulse to connect at the right time without this taking up too much (time) effort and doing justice to the *realness* described above: “It would have to be right in that little second that you think of someone. It would just have to happen so quickly.” (P4)

4.1.4 Intentionality

There was agreement among the groups that a requirement to actually create relatedness is that the technology or its function is always used intentionally and does not run automatically: “I think it is more about actively deciding that I want to seek contact with the other person, only then it really feels important.” (P1) One statement that came up more often is that without perceived intention, or the knowledge that the other person has triggered something on purpose, no feelings of relatedness can be created and they would then miss the purpose of it: “It has to happen consciously otherwise it is not worth so much for relatedness” (P9) This concern was even raised once during the discussion of awareness products and how they might not create relatedness if they are always on: “It would be important for us to use it consciously.” (P13) The only use case in which

the participants could imagine that an automated response would make sense was if they were busy and therefore unable to respond, thus signaling to the other person that they had no malicious intent in not responding or were doing so consciously but letting them know that they were busy: “It would be great to have e.g., a function like on the phone that tells the other person that I’m currently studying at the library and will not see their message at that moment.” (P2)

4.2 Hygiene factors

4.2.1 Confidentiality

One of the most discussed factors across all focus groups was *confidentiality*. It became clear that this concept is much more multifaceted and multi-layered than previously assumed. One aspect that occurred in all groups was that people do not want to feel observed and monitored by the other person through the technology in question: “I have to say that I find it rather off-putting when someone knows what I’m currently doing or where I am.” (P20) Participants expressed that they want to maintain control over the technology themselves and not put the control in the other person’s hands. It was particularly important to them to be able to decide for themselves what exactly they share with the other person and when, and also to have the option not to do so: “It is important to be able to turn it off again and to be able to decide freely when and what is transmitted.” (P6) In the family group, the fear of being controlled was stronger when thinking of parents compared to siblings: “I would not care for my siblings to know when I am home and when not but I definitely would not always feel comfortable with my parents knowing when I’m out.” (P3) Parallel to this, the colleagues group expressed not wanting to feel controlled by their supervisors, e.g., if the latter could find out when they are not at their desk doing something else or reveal private information they would usually not share at work. In addition, however, this was also the case the other way around: the participants further expressed that they would not want to know information about the other person at all times without restrictions. Instead, they would want to keep control in regard of what information they receive and not be forced to see what their grandparents, parents or distant friends are doing during their free time: “I really don’t have to know about everything my grandparents are doing all day long.” (P5) Regarding technologies that are directly on the body – like the sleeve from the VR example – which can also transmit touch, it came up during the colleagues group that one might feel uncomfortable letting a

technology not entirely controlled by yourself get so physically close to your body: “Anything too close or on my body would just feel too uncomfortable in the context of work.” (P18)

4.2.2 Context of use

The factor centered on the participants’ awareness that the use of the products requires them to disclose private information and that this intimate situation between the two users should be protected, even when they are not in the comfort of their home, thus privacy is not automatically ensured. Otherwise, as stated, they would not feel comfortable using such products. Since the participants also expressed that their intention to use would be higher if the technology could be used in many places, i.e., not stationary only at home, it would be an important issue for the design to enable this intimacy also in contexts when one is not alone but e.g., in public: “Vibration would work, so the whole world would not notice it like with the Google Watches, where everyone is immediately distracted because everyone is looking” (P10) or “[...] something small, a small object, because it is about random moments and not when you’re only at home.” (P4) Participants indicated that a certain level of unobtrusiveness and protection from others was important to them in this regard, as well as the consideration of possible inappropriate settings and situations. For example, one participant stated how the function of the technology should not interfere in presentation situations: “[...] for example, in presentation situations, it would irritate me a lot.” (P12) In regard to that, participants from the colleagues group expressed that they do not want to be too distracted from work because of the technology: “I think I would have a hard time staying focused if I heard or saw what my colleagues are doing.” (P16)

4.2.3 Reciprocity

The aspect of a possible problematic feeling of rejection through the technology was a subject of discussion among all groups. On the one hand, it was discussed that one could feel negative feelings of rejection if the other person did not use the technology equally or less often: “[...] then you ask yourself why I don’t get any attention and begin to self-doubt.” (P11) Participants argued that this could lead to not using the technology anymore in the long run. On the other hand, however, it was also mentioned that one might feel uncomfortable with evoking this feeling in the other person and thus feel some pressure or guilt related to the use of the product: “I don’t want people to feel guilty if they

think about me more than I do.” (P14) Again, participants indicated that this might vary from relationship to relationship, however, depending on what expectations one has of the other person and what is already established as normal in the relationship when using other technologies, such as text messaging: “I know that he will not answer while he’s at work but we immediately call each other when he returns.” (P12) The same applies to the extent to which one feels hurt by this rejection. Participants from the friends group e.g., stated how they would not be mad because they do not care that much if someone answers or not, or they already know the habits of the person and therefore would not take it personally: “My close friends know that sometimes it takes me a few days to answer which is why they’re not mad about that anymore.” (P10) They suggested to limit the amount of usage to counteract the feelings and also to discuss the use and expectations beforehand with their counterparts.

4.3 Meta topics

4.3.1 Added value

One aspect that came up repeatedly was the doubt of the technologies’ usefulness. In this context, the technologies were often compared to smartphones and social media, that i.e., enable an exchange of messages and pictures as well as phone and video calls: “I don’t see why I should not just use my phone to call them.” (P15) For example, participants often stated that more information was needed for more relatedness and more intent to use, or that they did not know what exactly to do once they receive the information they got from the technology: “So, I just wonder how useful it is to know if my partner is far away from the light or not.” (P12) Regarding the amount of information needed, the participants expressed how they would already feel closer to the colleague just by knowing that they are also sitting at their desk while in a call. Participants in the relationship group indicated that they already share a lot of information with each other throughout the day and therefore the threshold for feeling close to each other through another technology would be quite high. Their assessment of their intention to use was strongly influenced by the pragmatic qualities of the products: “I don’t think I would use it because it would be too irrelevant for me to know such trivial details.” (P9) In some cases, they viewed the technology as a trigger for a more pragmatic task such as a phone call: “I’m not sure if I would gain anything from it if I can’t use it to then also start a conversation.” (P16) or were making up use cases that appeared “useful” to them like taking care of elderly people: “I think this could be used

more efficiently in the context of old people that live alone to make sure everything's going well." (P4)

4.3.2 Decreasing excitement

Another aspect that was mentioned in all groups is the fear that over time the excitement for use might diminish, such as with a toy: "I could imagine that after three days I would be bored and stop using it." (P8) Especially over a longer period of time they were concerned that one might not get excited about using it anymore or even forget about using it: "[...] but I don't know if that's long term or if you use that for a week and then you're like okay cool." (P13) The comparison to a *tamagotchi* (i.e., a small handheld device displaying an electronic virtual pet that needs to be cared for) was drawn during two different focus groups. They stated that this could be prevented by changes in the functions or the achievement of different levels. Participants also indicated the need for an additional incentive to keep the technology exciting e.g., by adding humorous features. An overview over all UX factors is given in Figure 1.

4.4 Group preferences

According to the statements of the participants, the following preferences for the three technology categories can be drawn. The first product category awareness was liked most by the family and colleagues groups. The relationship group stated that they usually already know about what their significant others are doing. Also, when both are at home at the same time, chances are high that they might already be on the phone with each other. The friend group mostly stated that they were not really interested in that kind of information.

The second product category expressivity was liked most by the friends and relationship groups. However, concerns were raised in the friends group about how to handle it with more than one friend and that it might be difficult to coordinate more people. Hence, they might only use it within the context of close friends. In the family group, sending the sole message "I'm thinking of you" felt strange to them if they would not have the opportunity to give any

Table 2: Preferences of the focus groups regarding the discussed relatedness technologies.

Group	Strategy to create relatedness		
	Awareness	Expressivity	Joint action
Family	x		x
Friends		x	x
Relationship		x	
Colleagues	x		x

further explanations or information. This was similar for the colleagues group with even more concerns because it might be seen as harassment.

The third product joint action was especially liked by all groups except the relationship group. Regarding this product, the relationship group stated they cannot imagine it to feel as real as it needs to in order for them to create feelings of relatedness. Contrary, the other groups, but especially the colleagues group, thought it was a good way of bringing across feelings of relatedness. Table 2 provides an overview of these group preferences.

5 Discussion

This research aimed at investigating aspects and providing a theoretical basis on what should be considered during the design process to positively impact the user experience and acceptance of relatedness technologies. Conducting literature research and focus group interviews with four different user groups – families, friends, couples and colleagues – UX factors were derived and first ideas for their realization were collected.

5.1 An advanced checklist of UX factors of relatedness technologies

The revealed UX factors of relatedness technologies show parallels to existing concepts in UX research and relatedness research in psychology. Regarding the motivators, the factor *individual fit*, i.e., the fit between the technologies' functions and the particular relationship, resonates with relatedness theories and maintenance strategies highlighting the differences in relationships and how these come along with different needs to be met [29–31]. Another UX factor that was not explicitly mentioned in UX literature before is *realness* i.e., a representation as accurate as possible of the desired stimulus, creating an experience as close to reality as possible. As also known from other HCI practices that can support a feeling of relatedness (e.g., sharing selfies), the perceived

Motivators	Hygiene factors	Meta topics
Individual fit	Confidentiality	Added value
Realness	Context of use	Decreasing excitement
Immediacy	Reciprocity	
Intentionality		

Figure 1: Overview of UX factors for relatedness technologies.

authenticity of the other one's digital representation fosters positive experience [56]. Further, there is *immediacy* i.e., transporting the impulse easily and in real-time. The *immediacy* aspect shows parallels to the idea of simultaneity being important for technologies creating intimacy or evoking the feeling of joint action [4]. Lastly, *intentionality* i.e., knowing that triggering the action was intentional, which was already proposed by Janssen et al. [44]. Moreover, the motivators are interrelated to some degree and can also overlap or reinforce each other depending on the technology. For example, *individual fit* could create more *realness* and *immediacy* is partly reflected in a temporal component of *realness*.

Among the identified hygiene factors, *confidentiality* – i.e., being in control of the disclosure of one's own information as well as the obtainment from others', is also present in psychological relatedness theories which emphasize the importance of disclosing information (e.g., [8]). Also, *context of use* i.e., the preservation of intimacy and discreteness in different settings, corresponds to the preservation of privacy as a facet of relatedness [4, 44], as well as the need for autonomy and control [46–49]. While *confidentiality* refers to the interaction with the counterpart of the user, *context of use* comprises the environment, situation, and people around one while using the product. Finally, *reciprocity* i.e., the protection from feeling rejected or discomfort because of an unequal usage behavior, could be found to be relevant not only in real life [8, 9] but also when using technologies.

Moreover, two other factors of relevance for the experience of relatedness technologies (gathered under meta topics) could be identified: *added value of use* and *decreasing excitement*. *Added value* addresses the desire to have a clear idea of the technologies' benefit (also beyond existing communication tools) to be seen as a desirable product. As also reflected in acceptance models for hedonic technologies [57, 58], the goal of experience-oriented products naturally differs from classical ideas of usefulness, and therefore requires an appropriate context-adequate definition. This may appear as a challenge when introducing relatedness technologies: one may even feel that it makes some of the magic of a relatedness experience to not define it in too many explicit words which will be discussed in more detail in the next Section 5.2. Finally, *decreasing excitement* addresses the potential risk of losing interest in using such technologies once one gets used to their functions. This aspect also resonates with factors proposed in technology acceptance models adapted for hedonic technologies such as enjoyment and playfulness, which tend to lose their attractiveness over time (e.g., [59–61]). This aspect was at first not included among the relevant UX factors as they

were mostly mentioned in the context of technologies that solely serve hedonic purposes (like gaming).

Thus, in sum, the developed list of UX factors for relatedness technologies is also well-aligned with previous research on experience-oriented technologies. Note, however, that the present list of motivators and hygiene factors should not be seen as exclusive factors or as an exhaustive model. Instead, one may consider it as a checklist of considerable aspects for the design and evaluation of relatedness technologies, whereby the identified motivators represent possible starting points to design for relatedness and the hygiene factors represent possible obstacles for it. Naturally, the relevance of the factors from the proposed checklist also depends on the specific usage scenario and what kind of relatedness experience one wants to create. A key takeaway from the focus group interviews was that relatedness must not be understood as a design goal in a universal sense. Instead, it is a multifaceted construct that manifests itself differently (e.g., [25, 28]). Thus, before beginning to develop a concept, it is worthwhile to reflect on the envisioned scenario, target user group, and specific type of relatedness one aims to support. In conclusion, when designing for relatedness, one always needs to envision the specific type of experience to be created, and giving universal guidelines for design (e.g., more physical contact or giving more information is always “better”) would not do it justice.

5.2 Communicating “usefulness” of hedonic products

While previous research in HCI showed empirical support for the relevance of hedonic factors in technology acceptance (e.g., [60]), during the focus group interviews, it was noticeable that participants had a strong tendency towards discussing “pragmatic” aspects of the presented technologies. Although they did acknowledge the importance of feeling connected over distance and finding ways to do so, they easily fell into a pattern of searching for another use case or benefit regarding the product that goes beyond generating relatedness. Also, the products were often compared to texting or a phone call, wondering what their additional benefit would be. It seemed to be challenging to some extent to attribute the “benefit” of a product to aspects like having a positive or enriching experience. Despite this, participants also brought up the concern, that they might lose their excitement for the product over the course of time and thought about ideas combatting this. They argued to incorporate features that make the product more playful or entertaining and evolve over time. This indicates that they do see more than pragmatic value to it and actually desire an experience that goes beyond successfully carrying out

a task, however, the focus of the discussion often shifted to the pragmatic benefits. A possible explanation for this could be the so-called “Hedonic Dilemma” [62], i.e., although people value the hedonic from an experiential perspective, they overemphasize the pragmatic in report and choice situations where they feel a need to justify, which is easier for pragmatic qualities. This may also apply to the participants in the interview situation, where they found it easier to justify a product with functional benefits (e.g., transfer even more information than with the smartphone) instead of focusing on how the product could provide them with experiences and emotions that enrich their lives.

5.3 Design implications

First and foremost, as outlined above, the revealed UX factors may serve as a checklist of possible factors to consider when conceptualizing technologies with relatedness as (one) design goal. In some cases, participants’ statements already provided initial ideas on the realization of those factors, which may serve as additional inspiration.

For example, among the motivators and the factor of individual fit, participants suggested opportunities for product customization in all kinds of ways – from different colors (which was also proposed by Dey & de Guzman [63]) to intensities, making it “fit” to the specific relationship in focus. While previous research (e.g., [4]) often highlights the benefits of ambiguous stimuli in the context of relatedness technologies (e.g., transferring light signals instead of verbal messages), participants in our focus groups partly disagreed on that. They were more concerned by the other person misinterpreting ambiguous stimuli in a negative way, e.g., as harassment, especially in the colleagues group. Further, regarding *realness* and *immediacy*, participants thought of ways that enable an adequate and real representation of the thought and feeling that one wants to transfer. Specifically in the context of products that enable joint action, like VR games, the execution should be as real as possible in terms of the avatars and surroundings. The user should be able to trigger the stimulus showing as little action as possible and also spending as little time as possible on triggering it in order to not let the moment pass by. Regarding *intentionality*, except for possibly automatic absence notes to prevent feelings of rejection, according to participants, automatic impulses should be avoided when designing for the feeling of relatedness.

Regarding the hygiene factors, *confidentiality* was proposed to be realized by being able to turn the technology off at all times or install settings that enable the user to adjust when or where the technology is turned on. The same adjustment should be configurable regarding the incoming

information and stimuli. Further, the frequency of use could be restricted to a daily limit. Regarding *context of use*, and the option to use a technology in many different settings and not only at home, participants wished for portable products or technologies that can be integrated with existing technologies such as the smartphone. To ensure intimacy also in public contexts, sending and receiving stimuli should be able to happen discreetly and unobtrusively.

5.4 Limitations and future research directions

The present research provides an advanced basis for the research and development of relatedness technologies by combining relevant theoretical concepts from different strands of research and empirical insights from four focus groups. However, several limitations must be considered and can be taken up in future research.

First, the method of focus group interviews comes with specific restraints regarding reliability and generalizability of the results. Although focus groups present a good opportunity of gaining detailed and genuine insights into people’s views and experiences [64], at the same time, the results are subjective opinions and have to be interpreted as such. Moreover, the dynamics that arise during group interviews should not be disregarded. Participants’ answers may influence each other and draw the discussion more strongly into certain directions. We tried to counteract this by repeatedly encouraging the participants to widen their perspective and think of all the different aspects of their unique experiences. Furthermore, the setting of a group interview may not have been equally suitable for all group contexts. According to the impression of the moderators, the relationship group, for example, was more reserved when sharing their personal experiences than the other groups. Hence, we suggest examining topics that require a certain degree of privacy and openness from the participants by using interviews instead of focus groups to prevent feeling uncomfortable and enable more honest and open insights.

Second, as already discussed above, the list of revealed UX factors must be seen as an initial collection, but may be advanced by additional factors in the future. While we focused on the target groups and product scenarios that appeared to be the most relevant in the context of relatedness technologies, future studies could expand this to further domains. Also, based on the present insights, there are no clear and definite recommendations about which factors are the most important or which are more important compared to others. Therefore, next studies could examine the importance of different factors among different groups and relatedness experiences in more detail, whereby the here

revealed group preferences regarding relatedness strategies provide a useful starting point.

Moreover, the present initial observations and pre-suppositions about underlying factors for the acceptance of relatedness technologies should be further investigated in a systematic and hypothesis-driven manner. In this regard, it would also be necessary to develop more suitable measurement methods for the evaluation of relatedness technologies. As only few studies so far included an evaluation of their relatedness technology, no specific measurement methods exist yet. A first starting point for inspiration could be measurement scales developed for measuring social connectedness (see [65]), which could be adapted to the context of technology-mediated relatedness and suitable evaluation approaches for field studies (e.g., diary studies, experience sampling).

6 Conclusions

Feeling close and connected to other people is essential for our mental and physical well-being [10, 11]. One way to successfully maintain relatedness is the use of technologies (e.g., [2, 4]). In order to ensure that developed products also meet the requirements and needs of potential users and thus will eventually be used, this work investigated possible acceptance factors and a checklist was proposed: the checklist consists of several UX factors that represent motivators, i.e., factors that are essential for generating relatedness and ensuring that a positive experience is created during use, as well as hygiene factors, i.e., factors that take into account possible obstacles to use. The findings also suggest that there is no such thing as a universal relatedness experience. Therefore, when developing relatedness technologies, the focus should be on the type of relatedness experience to be created by the product during the conception phase.

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