Embracing Companion Technologies

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INTRODUCTION

In a sense, my smartphone has been my longest relationship.

Feeling connected to other beings and having positive interpersonal relationships makes us happy [25]. An essential aspect of satisfactory human relationships is empathy [6, 4]. It has the power to bridge the divide between two entities, bring them closer together and support long-lasting relationships. However, humans can experience not only a bond between themselves and other human beings, but also, amongst others, between themselves and pets or even inanimate objects.

Concurrently, developing emotional relationships with inanimate objects is a strong motif in popular culture. Aaron Cher-venak, the author of the epigraph above, famously married his smartphone. In the film Her by Spike Jonze [20], a man falls in love with the artificially intelligent virtual assistant Samantha. The video game Detroit: Become Human [2] puts the player in the middle of an android revolution where the boundary between human and robot emotion is blurred. Yet, life with (or next to) artificial beings is not only an inspiring topic for artists.

Beyond futuristic visions, interactive technologies which offer human-like assistance are becoming ubiquitous. With many of us living with a smart speaker, and some reprimanding their fellow users for not being kind to the device [38], digital beings are affecting our everyday interactions with the world and thus become part of our emotions, evoking empathy.

Consequently, empathetic and affectionate feelings towards objects have become a topic present in a variety of research areas [1]. For instance, Human-Robot Interaction (HRI) re-

1 https://www.news24.com/You/Archive/this-man-married-his-smartphone-for-a-very-good-reason-20170728
searchers pursue the idea of robotic agents that can evoke emotion and eventually become friends [32]. Marketing theory explores ways to exploit the potential of bonds between users and specific brands or products to increase sales [44]. Philosophers have been discussing our relationship with inanimate artefacts for more than a hundred years [24]. Such a multitude of perspectives on our future emotional relationships with technology poses a challenge to Human-Computer Interaction (HCI).

In HCI, a number of works report about users developing relationships with interactive artefacts (e.g. [38, 29, 43, 34]). However, these accounts are often focused on one design or one specific system. For a long time, HCI has also aimed to understand the complexity of the user experience of technologies on the meta level. Hassenzahl [14] classified the experience into pragmatic and hedonic in his seminal work. Later, the inclusion of eudaimonic qualities was postulated by Mekler and Hornbæk [27]. While these works offer a comprehensive view of user experience, they do not satisfyingly address the ways in which artefacts can fulfil social needs or the development of feelings towards objects. In these works, technology mostly assumes one of the two roles: it either mediates empathy between people, or it provides a feeling of being understood by the technology. The understanding of reciprocal empathy between humans and technology, feeling what the object is experiencing and vice versa is currently missing in models of user experience. This points to a lack of a theoretical understanding of empathy in HCI.

To mitigate this, we use work on empathy for objects from philosophy and accounts of user needs from past literature in HCI and Psychology to ground a discussion around an alternative conceptualisation of user experience that goes beyond existing understandings (e.g. [14, 27]) and one that is specific to companion technologies.

In line with philosophical methodology, the idea for this paper started with a sense of wonder mixed with curiosity, reflecting about notions of experiential qualities with interactive artefacts in HCI. Having conducted a study of Amazon Alexa users, one of the authors of this paper realised that they usually greeted their robot vacuum cleaner when returning from work. They also noticed that they were not becoming friends with the Pepper robot in their office, despite the robot’s best efforts. Consequently, we started to formulate questions about the role of technology in our lives and slowly discovered that we had difficulties describing these phenomena with the tools, theories and frameworks we already had at hand. We asked what does it mean to get used to an interactive artefact? When do objects become part of our lives? Did we develop a relationship with technologies? To answer this, we decided to go back to basics: fine arts, pop culture and philosophy. As homage to this intellectual journey and because it served as a helpful framework for our discussion, the structure of this work is inspired by Gauguin’s painting *D’où Venons Nous / Que Sommes Nous / Où Allons Nous* (Where do we come from? What are we? Where are we going?), also displayed in Figure 1.

Based on our theoretical exploration, we derive a framework for companion technologies. The framework introduces a new dimension of user experience—empathetic experience—which is characterised by four concepts: minded, feeling-experience, reflective and social significance. The purpose of the framework is to empower designers and HCI scholars alike to think about future interactive systems as companion technologies, anticipate user empathy for the designed artefacts and assure that companion technologies seamlessly integrate with everyday experience. To address empathy for everyday objects, we go back to the origins of the term empathy and how it has been interpreted and actualised in our societies.

In the remainder of this paper, we first outline where HCI work with a focus on user experience, charting how the HCI community conceptualised the user experience and user needs when interacting with technologies. This analysis in one of the two main pillars of our inquiry. Next, we critically discuss selected works from HCI focusing on artificial agents, reviewing our current understanding of users’ relationships with objects. This is followed by an overview of philosophical views on empathy for objects, which constitutes the second pillar of our theoretical exploration. We then discuss the framework for companion technologies, which we derived based on our analysis. We later show how the framework can be used to reflect on crucial aspects that are predominant in the experience of technology, but also as a tangible resource to support the design of new interactive companions. To that end, we use two examples from past research which we analyse with the derived framework. We conclude with future challenges for HCI that emerge from framing interactive artefacts as companion technologies.

WHERE DO WE COME FROM?: UNDERSTANDING THE USER EXPERIENCE

HCI has an established history of recognising the importance of experiential qualities in interactive technologies and embedding them in design. Almost two decades ago, Hassenzahl [14] discussed pragmatic and hedonic product qualities. In his work, he emphasises that the perceived character of a product leads to emotional consequences, such as the experience of joy. Hedonic, non-instrumental product characteristics can encompass aspects such as aesthetic appeal, fun, stimulation and joy. Pragmatic, instrumental product qualities encompass aspects such as utility, usability, efficiency and usefulness [7].

Mekler and Hornbæk [27] extended the notion of user experience and introduced eudaimonic quality. In their empirical inquiry, they found that hedonia was mostly about ephemeral moments of pleasure, whereas eudaimonic qualities were characterised through striving towards personal growth, a focus on self-development and personal goals. Furthermore, they found that eudaimonic experiences are characterised through long-term importance, meaning and need fulfilment, and that social experiences show significantly higher relatedness and feelings of meaningfulness than not-social experiences. Their results also showed that eudaimonic and social experiences were considered as more meaningful than hedonic experiences. Interestingly, however, the hedonic and the eudaimonic were...
not strongly correlated to the need for relatedness, which sug-
gests that the experience of meaning and the fulfilment of the
need relatedness might be able to be addressed through experi-
ences that are not necessarily driven by hedonic or eudaimonic
motives (see table 1 for an overview of the different psycho-
logical needs). Building on their previous work as well as
research from Psychology, Meeker and Hornbæk [28] derived
a framework focusing on the experience of meaning in HCI.
The five components of their framework are connectedness,
purpose, coherence, resonance and significance. Connected-
ness can be described as feeling connected to oneself and the
world. Previous experiences as well as interactions with the
world are connected to what is happening right now in the
present moment, and shape the experience of meaning. Feel-
ing connected to oneself is the basis of experience of meaning.
However, Meeker and Hornbæk emphasised that, due to its
evasive nature, connectedness is the most difficult component
of their framework to design for. Purpose describes a sense
of direction and having an idea of how one’s higher level
goals are connected to one’s actions. Coherence describes
having an understanding of one’s experiences and being able
to make sense of them. Very straightforward, resonance can
be described as something ‘just feeling right’. Significance
describes experiences that matter beyond one’s own life.

While these theoretical approaches to experience encompass
a wide spectrum of the ways interactive artefacts affect us and
how we perceive them, they still offer little insight into how we
develop relationships with technology. Indeed, Hassenzahl’s
framework reveals that voice lighting control is pleasurable,
and Meeker and Hornbæk’s can show how accessing audi-
books with Alexa can provide a meaningful experience. Yet,
we still do not know how to describe the quality of the ex-
perience that lead to Alexa assuming a social role [34]. In
search of an explanation, we first turn to literature on psycho-
logical needs, which has previously been used as a means of
explaining the user experience of interactive technologies [15].

**Psychological Needs and Interactive Artefacts**

Almost two decades ago, Jordan [21] introduced his frame-
work of the four pleasures, physio-, socio-, psycho- and ideo-
pleasure to the research community. Jordan’s work is inspired
by Maslow’s hierarchy of needs [26]. Jordan emphasised the
need to integrate pleasure-based approaches into interactive
products, and, most importantly for this work, stated that his
framework introduced pleasures people might seek as well as
pleasures products can potentially address. Physio-pleasure is
determined by the sensory organs and connected to physical
sensations. Socio-pleasure can be described as the joy or the
satisfaction that arises through social interactions. Psycho-
pleasures are pleasures connected to cognitive as well as emo-
tional reactions. Pleasures stemming from people’s values are
called ideo-pleasures.

A year later, Sheldon et al. [39] published their work on psy-
chological needs. Their study is of particular importance for
the HCI community since one of the most influential ap-
proaches to psychological needs in interaction design is based
on their work. More precisely, Hassenzahl et al. [15] empha-
sised the importance of psychological needs for experience-
oriented technology design. Sheldon et al. [39] conducted
three consecutive studies in order to explore the importance
of a variety of psychological needs. They derived and ex-
plored ten psychological needs from a variety of theories of
psychological need fulfillment: self-esteem, autonomy, com-
petence, relatedness, pleasure-stimulation, physical thriving,
self-actualization-meaning, security, popularity-influence and
money-luxury (see table 1 for an overview and short descrip-
tions). The four most salient needs in their study were self-
estee, autonomy, competence and relatedness, which is in
line with and extends Self-Determination Theory by Ryan and
Deci [37].

The avid reader can observe that most of the psychological
needs proposed by Jordan or Sheldon have been addressed
by past conceptualisations of user experience (see figure 2). Yet,
one of the current user experience frameworks directly
addresses needs related to the social aspects of interactions
with a technological device as opposed to the social aspects
of interactions with humans mediated through a technological
device. There is a simple reason behind that fact. Traditionally,
the social aspect of interactive technologies has been limited
to multiple users interacting with or through an artefact. The
domain of social computing specifically studies how social
behavior is affected by computer technology.

However, what happens when technologies become social
actors? While we have known since early HCI days that tech-
nologies can have social features [30], how do we understand
the way in which they weave themselves into the fabric of our
social being? To begin answering this question, we propose
conceptualising artefacts that have a profound social presence
as companion technologies. Before we present our notion of
companion technologies, we need to take stock of the current
state of the the art in HCI.

**WHAT ARE WE?: CONCEPTUALISATIONS OF SOCIAL
AGENT TECHNOLOGIES IN HCI**

In HCI, companion technologies have been explored under a
variety of different names. Hence, considering technologies
and systems as agents is not a new subject. Norman [31] dis-
cussed the challenges, chances and myths connected to this
notion. Shneiderman and Maes [40] discussed the idea that
humans will have to entrust specific tasks to digital agents.
These technologies should then either act on a user’s behalf
or offer suggestions to the user. Today, the scenario described
by Shneiderman and Maes is reality. Artificial agents have be-
come ubiquitous, but the interaction between humans and com-
puters is still in flux. Farooq and Grudin [10] addressed this
shift by discussing the continuum from Human-Computer In-
teraction to Human-Computer Integration. They stated that the
interaction between humans and computers could be described
as stimulus-response and emphasised that this interaction style
does not constitute a human-computer partnership. On a sim-
ilar note, the notion of computers as equal partners has been
a longstanding subject of critical debate within the HCI com-
munity [11]. What constitutes a meaningful human-computer
partnership that takes user needs into account? Should com-
puters try to understand users in real time? Is an in-depth
understanding of internal processes of the machine needed?
Figure 2: Psychological needs and the corresponding experiences. Mapping of the four pleasures and hedonic-pragmatic based on [15]. Mapping of hedonic-eudaimonic based on [27]. Note that the mapping of meaning is based on the interpretation of the authors of this work, as no explicit relation to the full spectrum of needs was provided in the original paper [28].

| Psychological need                  | Description                                                                 |
|------------------------------------|-----------------------------------------------------------------------------|
| Autonomy                           | Feeling that activities are chosen by oneself and to be the agent of one's life |
| Competence                         | Feeling effective and competent                                              |
| Relatedness                        | Feeling close to some other individual, feelings of interpersonal connection |
| Self-actualization-meaning         | Sense of long-term growth                                                   |
| Physical thriving                  | Sense of physical well-being                                                |
| Pleasure-stimulation               | Feeling of pleasurable stimulation                                          |
| Money-luxury                       | Focus on wealth, luxury and nice possessions                                |
| Security                           | Feeling of order and predictability in one's life                           |
| Self-esteem                        | Self-worth and global evaluation of oneself                                 |
| Popularity-influence               | Feeling of having the ability to win friends and influence people           |

Table 1: Psychological needs and brief descriptions based on the work from Sheldon et al. [39]. Note that their work integrated a variety of different needs from other works, such as Deci and Ryan’s self-determination theory [37], Maslow’s theory of personality [26] and Epstein’s cognitive-experiential self-theory [9].

Do humans always keep control of the actions of the technology? All these questions continue to be discussed, and the notion of computers as partners is more relevant than ever [36].

HCI’s reaction to a proliferation of social agents around us has been a very analytical one; an attempt at classifying such artefacts. Digital game research analysed the design space of companion characters in games [8]. A recent CHI paper from Grudin and Jacques [13] outlined the design space of conversational agents and discussed the term human-computer symbiosis. Their work focused on chatbots that engage in conversations and categorised them. Interestingly, the paper points to contradicting empirical results regarding successful chatbot design. Based on the example of embedding humour in the design of a chatbot, the authors emphasised the difficulty when it comes to designing ‘good’ bots. While some users enjoyed the humorous responses, the results also showed that humour led to higher expectations towards the technology. In other words, the designer is faced with the conundrum of personality characteristics increasing the potential of positive experiences for users when interacting with chatbots, which in turn may lead to expectations that cannot be met. This issue illustrates how we need to better conceptualise technologies which are social agents in order to design them successfully.

Past research has also addressed specific types of agents. ‘Objects with Intent’ was one proposed concept which included intelligent everyday things such as lamps or jackets [36, 35]. In his recent study, Rozendaal [36] found that the same ob-
We postulate using the word 'companion' to stress the potential to interact with another human. As expectations are inherently tied to past experiences, projecting a personality onto an interactive agent can be framed as an attempt to understand empathy, which is the ability of individuals to understand, feel nature and empathy does not necessitate active participation. To that end, we review work in philosophy about empathy which people can develop towards artificial artefacts.

The origin of the word empathy is the Greek empatheia ('em' means 'in' and 'pathos' means 'feeling'). Empathy is 'the ability to share someone else's feelings or experiences by imagining what it would be like to be in that person's situation'. Early work by Herder [17] described empathy as the ability of individuals to understand, feel nature with all its manifestations in analogy to oneself and perceive these manifestations. Jacques [13] that managing expectations is key in interacting with agents. If a user projects a personality onto an interactive artefact, this projection stems from the user's own experiences. As expectations are inherently tied to past experiences, projecting social agency onto a technology must lead to empathy for the object. This observation is the key notion of this theoretical exploration.

Companion Technologies
In order to unpack the notion of empathy in HCI, we propose to use the term companion technologies. A companion technology is an interactive artefact that can evoke empathy in a user.

The philosopher and poet Johann Gottfried Herder discussed differences in the experience and the perception of different objects such as sculptures and paintings [18]. He argued that sculptures are made for the tactile experience, whereas paintings are made to be looked at. Consequently, we need to ask what the purpose of a companion artefact is. Are they made to be looked at, touched, or experienced? We propose framing companion technologies as artefacts that are designed to evoke an emotional response, similar to that of interacting with another human.

We postulate using the word ‘companion’ to stress the potentially equal relationship between the artefact and the user. The etymology of the word (‘one who breaks bread with another’) stresses a deep mutual relationship and a complementary duality. This contrasts with the term ‘partner’, which etymologically emphasises division and evokes connotations with work environments. The term ‘agent’, stresses acting on the world and empathy does not necessitate active participation.

EMPATHY FOR OBJECTS IN PHILOSOPHY
To fully understand companion technologies as ones that evoke empathy, we need to first investigate the concept of empathy. This analysis constitutes the second pillar of our theoretical exploration. To that end, we review work in philosophy about empathy which people can develop towards artificial artefacts.

The noun ‘empathy’ was introduced to English by Tichener. It is the translation he chose for the term Einfühlung, introduced by Robert Vischer in 1873. Interestingly, Vischer himself was inspired by the way Karl Sterner deciphered dreams. In Sterner’s work, he recalls this inspirational moment and describes the process of the unconscious projection of the bodily form as well as the soul into the form of an object (as cited in [5]). Lipps [23] called this phenomenon ‘objectified self-enjoyment’.

Through empathy, individuals make sense of other minds [42]. In the beginning of the 20th century, empathy was a combination of two independent philosophical traditions; philological sciences and philosophical aesthetics. While the philological sciences mainly focused on the notion of understanding (‘Verstehen’), philosophical aesthetics introduced the concept of empathy (Einfühlung) per se [42].

Theodor Lipps [24] united these two notions. For him ‘Verstehen’ and ‘Einfühlung’ are connected as they both have to do with how we understand phenomena that express themselves externally, but at the same time represent an internal expression through their external appearance. For instance, a mental state can be expressed through an artefact (Einfühlung) or through a physical reaction (Verstehen). Due to this affinity, these two notions have sometimes been used interchangeably. Lipps argued further that empathy is based on the mysterious tendency of humans to motor mimicry. He postulated that, since this tendency is often not allowed, for instance due to external circumstances or social norms, this interdiction leads to ‘inhibited imitation’; an inner tendency to imitate. This led him to explore the things and creatures we can imitate and ask such as if something or someone is a minded creature or a minded object [42]. This dilemma is still relevant today as we wonder if and when we can ascribe social agency to objects.

Lipps was criticised by Edith Stein [41] for using the notions of empathy (‘Einfühlung’) and feeling of being one with the other individual or an object (‘Einsfühlung’) interchangeably [42]. He reacted to this criticism by explaining that empathetic identification did not lead to the person losing themselves. Instead, it could be compared to feeling the sadness communicated through a piece of art; one can feel the sadness, but without all its motivating force [24].

The thinking of Lipps was critically questioned and further developed by Edith Stein and Edmund Husserl. They extended the understanding of empathy from understanding other minds to supporting personality development due to the ability to acknowledge, engage and understand opinions other people have...
about you [16]. This idea echoes our experiences with interactive agents. Individuals can feel empathy towards companion technologies, but the companion technology can potentially also trigger personality development through taking an independent position and confronting the user with content (or potentially opinions) about him or herself.

Rudolph Hermann Lotze, one of the most important philosophers of the nineteenth century, had a significant impact on Lipps’s work. They shared the view that there are two different kinds of experiences; sense-experience and feeling-experience [12]. Sense-experience is object-directed, whereas feeling-experience is self-directed. In the description given by Lipps, experiences always embed two perspectives an immediate perspective and a mediate perspective (as cited in [12]).

Even though sometimes critically discussed, the after-effects of Lotze’s thinking can be found in Neo-Kantianism, Phenomenology, Frege’s conception of Logic, Psychology and Theology. Lotze sees knowledge not as one system but as a variety of different views. This view resembles the eclectic and multidisciplinary nature of knowledge in HCI. In his work, Lotze defines beingness (‘Das Sein’) as relations; relations as a system of interactions. Through the expression of such relations in the soul, meaning and significance become apparent. In other words, Lotze is arguing for the predominance of the subjective mind, where all phenomena take place. The subjective mind must strive to be objective and its integration into reality is imperative. As we argue further below, this stance is also applicable to companion technologies in HCI.

Lotze addressed and attempted to resolve the conflict between scientific realism and idealism. He emphasised the enriching the reciprocal relationship between abstract constructs of idealism and applying them to the world. On the other hand, he pointed out that the adoption of principles focusing on the behavior of things (taking a scientific realism stance) and assuming their validity requires idealism to some extent. We call this complementary duality. Complementary duality can be a useful tool to shed light on the duality regarding the understanding of companion artefacts in HCI research. Adopting a complementary duality mindset disentangles the differentiation between empathy for objects and the inevitable experiential companion qualities that correlate with it.

Another key differentiation in Lotze’s work is between ‘Vorstellen’—envisioning as a cognitive function and ‘Vorgestelltem’—the object which is envisioned. This differentiation points towards the distinction between how a digital companion is experienced and what it actually is. While the user and the companion technology are in a mutual relationship, the user is the one in the active role, projecting social features onto the artefact.

Lotze argues further that, when it comes to deciding between different alternatives, it is not enough to consider which one of the different alternatives is necessary. Instead, one also should consider what is meaningful. Applying this thinking to companion artefacts facilitates an understanding of how they can be designed and which experiential qualities might be embodied in them. Here, Lotze’s views echo the framework proposed by Meckler and Hornbæk [27]. Furthermore, Lotze stressed that this differentiation was not synonymous of a value-system but instead was value-neutral. This is congruent with HCI’s pursuit to build utilitarian artefacts that also provide meaning and pleasure.

AN EXPERIENTIAL FRAMEWORK FOR COMPANION TECHNOLOGIES

Here, we propose a way of conceptualising companion technologies and understanding the experiences they evoke in the form of a framework. Importantly, the goal of the framework is to capture the felt experience of companion technologies and not their true nature. Thus, we leave the phenomenology of digital companions to future work. Our framework explicitly extends past understandings proposed by Hassenzahl [14] and Meckler and Hornbæk [27] by including the social aspects of the experience between human and companion technology. Such social aspects are crucial for companion technologies. We specifically focus on social experiences that do not occur between two humans mediated by technology. Instead, we study social experiences between the human and companion technology. Figure 3 illustrates the framework.

Before we describe the framework in detail, we must mention its key limitation. As Stueber [42] noted, Lipps’s hypotheses regarding empathy are neither scientifically sufficiently explored nor empirically proven. In line with the critique outlined by Stueber, we do not argue that the notion of empathy based on Lipps’s understanding can necessarily lead to genuine insights about the mental state of other individuals. On the contrary, we emphasise that it is unimportant (from an experiential standpoint) if individuals generate what they might deem true or objective knowledge about other individuals or objects. Instead, we extend the current understanding of subjective user experience and what makes interactions with technologies meaningful. We attempt to integrate empathy towards objects into the current understanding and believe that the experiential qualities caused by empathy towards objects do not stem from real insights or true knowledge, but are sourced from the innate human need to feel someone or something.

The Four Framework Concepts

In line with the philosophy of empathy which contributes to our framework, we call the dimension of experience specific to companion technologies empathetic. Empathetic qualities of technologies are complementary to pragmatic, hedonic and eudaimonic qualities. Further, we synthesise four concepts from philosophical work that help in identifying empathetic qualities in technologies. In the following, we describe these concepts in detail. For each of the concepts, we list challenges for HCI that emerge from the conceptual stance taken in our framework.

Minded

Firstly, we postulate that companion technologies which evoke empathy must be minded. This concept is inspired by Lipps’s investigations (cited by [42]) into what constitutes minded creatures or minded objects. Users can experience technology empathetically if a companion technology produces a sense
of wonder. If an artefact is perceived as supernatural or mystical, users try to make sense of it, and strive to understand if it is minded. That is where the empathetic experience begins. The technology produces a sense of wonder in users which evokes empathetic experiences because of the need of users to understand its mind. The spectrum of wonderment about companion technologies ranges from joy because the companion is perceived as amusing or helpful (e.g. mobile digital assistants), through surprise about the efficiency of the technology (e.g. smart home appliances), to awe because of the incomprehensible sophistication and cognitive abilities of an android (e.g. encountering a life-like social robot). The fascination with the technology paired with a magical element in the interaction process leads users to ask questions about themselves and the interactive artefact. Only a companion that is perceived as minded by the user can form a social dyad with the user. This, in turn, leads to the user wondering about the motives of the companion and how the companion perceives the world, thus forming an empathetic bond with the technology. Consequently, the following challenges for HCI arise:

**FUTURE CHALLENGES FOR HCI**: How do we design for mind-en-ness of companion technologies? How can we inform users about the mindedness of specific companion technologies? Which design characteristics lead to different perceptions of minds of technologies as companions?

**Feeling-Experience**
A true companion technology enables the user to be part of the technology’s feeling-experience (Selbstgefühl, as postulated by Lotze [12]). According to Lipps, sense-experiences are object-directed, while feeling-experiences are self-directed. For instance the feeling-experience of bodily warmth is related to the sense-experience of the heat of the radiator. Yet, feeling-experiences can also be object-directed, e.g. the heat of one’s body. On the one hand, this implies that users should be able to establish boundaries between their perceptions of themselves and companion technologies. On the other, users are likely to project the ability to have both kinds of feelings onto companion technologies and expect the same of the technologies. This is perhaps best illustrated using an example. The smart oven that will switch off when the user is manipulating food inside of it builds a perception of knowing the user’s body heat. As the oven also communicates its own heat, the user perceives the experience as empathetic as the oven and the user share a feeling-experience. Hence, the quality of the interactive artefact being able to present itself as capable of having feelings that are not object-directed. Expressing self-directed feelings builds an impression of agency for companion technologies. As outlined above, we assume that people potentially enjoy to delegate some responsibility to a companion technology with agency. The question remains: how can this need be translated to the design of technologies as companions?

**FUTURE CHALLENGE FOR HCI**: How are different levels of agency and different levels of fidelity of companion technologies related? How can we balance companion agency and the companion assuming responsibility for tasks?

**Reflective**
Having established that a true companion technology is perceived as minded and capable of self-directed feelings, we now turn to the feelings that the technology evokes in users that build empathetic experience. The need to wonder about technologies and investigate if they are minded is motivated by the fact that minded entities are able to express opinions and thus may have opinions about the user. Here, we apply Husserl’s thinking and stress that the empathetic experience is built by the companion technology’s perceived ability to form and engage with opinions about the user. Consequently, how a person perceives their artefact or companion might also change how this person perceives him- or herself, thus giving the companion social agency. Through these interactions and because of developing an empathetic relationship, users have the potential to learn, to develop, based on the interaction with the technology. This is where our framework connects with eudaimonic experience, creating a continuum of experiences.

**FUTURE CHALLENGES FOR HCI**: How do we design for reflective experiences with companions that motivate users to learn about themselves and develop their potential? How can we prevent creating digital companions from exhibiting behaviours that users perceive as judgemental?

**Social Significance**
Finally, we use Lotze’s notion of significance to highlight how companion technologies can assume social roles. Through the expression of relations in the soul, meaning and significance become apparent. In order for an artefact to evoke empathy, the relation to the object must be perceived as significant. As a user integrates the technology into his or her everyday life, they intentionally ascribe meaning to the actions of the objects and thus significance to the object’s actions. Stueber [42] made the point that empathy is the default method to build an understanding about other minds. We extend this position and argue that empathy is central to building an understanding of inanimate objects as well as of the bonds people develop towards them. Thus, empathy towards objects can be the means to explain the inexplicable. This fact is of increasing importance as systems become more and more complex.

In this concept, our framework is also inspired by Rozendaal’s work [36] who outlined and applied Dennett’s theory of intentionality. The notions of the theory of intentionality complement the philosophy of empathy, not least because of the conceptual affinity to folk psychology. Dennett’s theory of intentionality includes three stances: the physical stance, the design stance and the intentional stance. This can be explained using the example of a sundial, where one could say that a sundial tells the time because it combines the Sun’s altitude or azimuth with the gnomon and makes a shadow. Seen from a design stance the sundial shows the time with the help of the sun because it was designed to do so. From an intentional stance, the sundial has beliefs about time, and acts on its beliefs because of a desire to show a specific time dependent on the position of the sun. Similarly, the theory of intentionality explains the psychology of how users can ascribe social significance to companion technologies.
FUTURE CHALLENGE FOR HCI: How can we manage the user’s understanding on the companion technology and enable an evolution of understanding? How do we assure that object stay mystical enough to remain significant? And how do we design technologies that take actions to which users can ascribe meaning?

WHERE ARE WE GOING?: USING THE FRAMEWORK
So far, our framework may seem ephemeral as it is derived from high-level concepts. To mitigate this, this section discusses two examples from previous research on technologies that may be companions. We show how our framework enables analysing the experiences reported in the research and mapping the empathetic experiences of the technologies in question.

We chose two examples of past research [43, 3] that investigated artefacts that can be conceptualised as companion technologies. These two papers address two companion technologies that are present in many modern houses. We chose a robotic vacuum cleaner and a smart speaker as the two examples. These companion technologies have different levels of complexity, offer different functionalities and use different interaction techniques. Yet, they share many companion qualities. While we cannot pay justice to the two papers and analyse them in full depth, we provide an overview of how the results presented in those works could be interpreted with our framework. We highlight the psychological needs that can be identified in the two examples through the application of our framework in bold font. Please note that we highlight psychological needs in case they were fulfilled and in case the potential for their fulfilment could be identified.

Roomba
We first take a retrospective look at work by Sung et al. [43] who investigated how users developed relationships with their robot vacuum cleaners and the impact the device had on the home. A key finding of the work was that users developed intimacy towards their cleaning robots (Relatedness). Through the lens of our framework, intimacy towards objects can be identified in the two examples through the application of our framework in bold font. Please note that we highlight psychological needs in case they were fulfilled and in case the potential for their fulfilment could be identified.

As the Roomba changed from an inanimate artefact to ‘something like a pet’ or a ‘family member’, users developed a sense of pride for the device. The results from Sung et al. showed that participants were positive towards the reflection and learning process triggered by the devices (Self-actualization-meaning). Interestingly, the study by Sung et al. also showed that the participants were positive towards the reflection and learning process triggered by the devices (Self-actualization-meaning).

In contrast, the positive experiences with their Roomba provided a balance for extra work required for behavior change. This shows the differentiation we addressed in FEELING-EXPERIENCE. The study participants seemed to have two different experiences: one was the experience of not enjoying tidying that much, the other the experience of enjoying the presence of their Roomba a lot (Pleasure-Stimulation). At the same time, their Roomba had agency, making them neat and content. Thus, the user and the Roomba shared a feeling of tidying and sharing joy (Relatedness).

Further, the results suggested the SOCIA SIGNIFICANCE of the Roomba. The theme Lifelike associations and engagement with Roomba showed that the participants formed an understanding about the object and ascribed intentionality to it. For instance, participants gave their vacuum robots names, nicknames or even changed the name after a while so that the name fitted the personality of the Roomba. Furthermore, some described it as a valuable family member and one participant stated that he felt a stronger bond to his Roomba than to his mopping robot (Relatedness). This showcases that through the integration of the object into the users’ everyday lives, the vacuum robot assumes social roles and its SOCIAL SIGNIFICANCE increases.

In general, the authors found that participants formed stable, intimate attachments to their Roombas (Relatedness). This finding can be explained through our framework concept of SOCIAL SIGNIFICANCE. Through integrating the Roomba into their everyday life, it became a significant part of it. Within the theme Feeling happiness towards Roomba, participants described situations where the Roomba forced the whole family to be neater. This example showcases the learning experience (Self-actualization-meaning) we describe in the framework concept REFLECTIVE. The owners of the Roombas gave the object social agency and valued the opinion of the vacuum companion. The Roomba, on the other hand, formed the opinion about its owners that they were untidy. Users engaged with the companion technology and valued the opinion of the artefact. Consequently, the whole family learned and became neater.

Amazon Echo
Next, we use our framework to understand the results of a more recent paper. Cho et al. [3] explored how eight households used an Amazon Echo over 12 weeks. The authors described the journey of the study participants and their Amazon Echo. They mapped their results onto five stages, which represent the experiential journey of owning the device: pre-adoption, adoption, adaptation, stagnation, acceptance. In contrast to Roombas presented in the previous section, this research shows the Echo did not become a companion tech-
At first glance, Alexa appears to be more sophisticated than were eventually abandoned. Nevertheless, we believe that our framework can be applied and generate insights, independent of the success of an interactive artefact becoming a companion technology or not. We illustrate in the following paragraphs.

Initial results of the study showed that Alexa may have gained social significance. However, the users soon started to be disappointed by the device. The technology did not live up to their expectations. In the view of our framework, this implies that users had the expectation of Alexa as minded. In the beginning of the study, some participants described a sense of joy when they interacted with Alexa (pleasure-stimulation), as described in our framework concept social significance. But the sense of joy did not evolve to wonderment about the technology nor did it offer reflective experiences (self-actualization-meaning). The participants did not enjoy interacting with Alexa (pleasure-stimulation) and the usefulness score for the Amazon Echo was lowest in the adoption phase.

At first glance, Alexa appears to be more sophisticated than the vacuum robot Roomba. But, contrasting the two studies described above, users developed a more empathetic bond towards their Roomba compared to Alexa. One potential explanation behind this difference, derived within our framework, could be that the Amazon Echo is static, whereas the Roomba conquered personal space in the houses and apartments of the participants. Consequently, people started to adjust their routines and their space to the needs of the technology and tried to make sense of the Roomba’s random movements [43]. In contrast, participants were not ‘forced’ to make sense of Alexa. They simply put the device in a corner and were able to forget about it. This is reflected in the statement of one participant in Sung et al. study who pointed out that he ‘simply forgot about her’. As most participants did not value Alexa, it failed to become socially significant.

One possible explanation behind Alexa’s failure could be that, in line with previous work and results from Cho et al. [3], voice interaction is connected with users perceiving technology as human-like. This raises their expectations towards the technology. We hypothesise that due to this fact the expectations towards Alexa providing a companion-like experience are higher than towards Roomba. Users had to make a larger effort to make sense of Roomba because the robot did not use human speech but beeping sounds instead [43]. The need for a minded Alexa was further strengthened by the reported desire for a smart home. In the view of our framework, this could mean that participants would have enjoyed to delegate some responsibility to the digital companion (autonomy), which is addressed in the reflection concept in our framework.

The contrast between these two cases shows that the forming of an empathetic bond between the user and their (prospective) companion technology is key for sustained use that brings joy. Failure to form such a bond resulted in abandonment.

Limitations and thematic demarcation

In this section, we critically reflect on the limitations of our approach to conceptualising empathetic user experience. First, we should note that we did take a strong stance in constructing the framework around works in the philosophy of empathy. While we chose the works that form our framework with utmost care, the framework is dependent on assuming that certain philosophical stances are valid. The primary roles of the framework are serving as an analytical lens and providing a starting point for comparison and discussion. As long as no predictive powers are ascribed to the framework, we believe it can fulfil its role and its conceptual criticism can enable further contributions.

Further, we recognise that there is some conceptual overlap between individual components of our work and research by Mekler and Hornbæk [28]. However, the main differentiation between their work and ours is on the meta-level. Mekler and Hornbæk [28] focus on the experience of meaning in HCI. In contrast, we focus on social bonds between humans and their companion technologies.

We also need to recognise that a framework like ours cannot cover the full body of work on empathy and related concepts from a variety of disciplines. For instance, we note that there is a significant body of empathy research in Social Psychology (e.g. [6]). There are also related strains of HCI work such as symbiotic interactions [19] that take a sensing-centered approach to designing companion technologies. However, one of the contributions of this work is adapting the philosophical work on empathy for object to HCI issues and providing an alternative perspective on the experience of technologies that evoke empathy.

Finally, we acknowledge the conceptual closeness of the notion of Empathy for Objects to Theory of Mind [33], which was used to a certain extent in Human-Robot Interaction research, e.g. [22]. However, whereas we focus on emotional experiences embedded in the notion of empathy, theory of mind focuses on the cognitive perspective.

Conclusion

There is a large variety of companion technologies, which are present in books, movies, computer games and in our homes. While HCI has been attempting to understand such technologies for two decades, our conceptual understanding of companion technologies still remains in a conceptual flux.

To contribute to this discussion, this paper outlined a framework for understanding the experience of companion technologies—interactive artefacts which can evoke empathy. We postulate that companion technologies have the potential to fulfil psychological needs left unaddressed by past generations of technologies and frameworks of user experience. Our framework is built using notions from the philosophy of empathy, focusing on empathy for objects. We introduce four concepts that characterise empathetic experience: minded, feeling-experience, reflective and social significance. We showed that our framework concepts can be effectively used to analyse past work that focused on companion technologies and to connect psychological needs from the findings.

We hope that our framework and the future research challenges for companion technologies provided can spark engaging discussion in the HCI community, support designers in exploring...
companion technologies in more depth and mitigate some of the potential challenges when designing technologies as companions.

REFERENCES
[1] Russell W Belk. 1988. Possessions and the extended self. Journal of consumer research 15, 2 (1988), 139–168.
[2] David Cage. 2018. Detroit: Become Human - FREEDOM HAS A PRICE. (2018). Quantic Dream.
[3] Minji Cho, Sang-su Lee, and Kun-Pyo Lee. 2019. Once a Kind Friend is Now a Thing: Understanding How Conversational Agents at Home Are Forgotten. In Proceedings of the 2019 on Designing Interactive Systems Conference (DIS ’19). ACM, New York, NY, USA, 1557–1569. DOI: http://dx.doi.org/10.1145/3322276.3322332
[4] Duncan Cramer and Sophia Jowett. 2010. Perceived empathy, accurate empathy and relationship satisfaction in heterosexual couples. Journal of Social and Personal Relationships 27, 3 (2010), 327–349.
[5] Gregory Currie. 2011. Empathy for objects. Empathy: Philosophical and psychological perspectives (2011), 82–95.
[6] Mark H Davis. 2018. Empathy: A social psychological approach. Routledge.
[7] Sarah Diefenbach, Nina Kolb, and Marc Hassenzahl. 2014. The ‘Hedonic’ in Human-computer Interaction: History, Contributions, and Future Research Directions. In Proceedings of the 2014 Conference on Designing Interactive Systems (DIS ’14). ACM, New York, NY, USA, 305–314. DOI: http://dx.doi.org/10.1145/2598510.2598549
[8] Katharina Emmerich, Patrizia Ring, and Maic Masuch. 2018. I’ll Glad You Are on My Side: How to Design Compelling Game Companions. In Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY â€ž18). Association for Computing Machinery, New York, NY, USA, 141â€ž152. DOI: http://dx.doi.org/10.1145/3242671.3242709
[9] Seymour Epstein. 1998. Cognitive-experiential self-theory. In Advanced personality. Springer, 211–238.
[10] Umer Farooq and Jonathan Grudin. 2016. Human-computer Integration. interactions 23, 6 (Oct. 2016), 26–32. DOI: http://dx.doi.org/10.1145/3001896
[11] Umer Farooq, Jonathan Grudin, Ben Shneiderman, Pattie Maes, and Xiangshi Ren. 2017. Human Computer Integration Versus Powerful Tools. In Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA ’17). ACM, New York, NY, USA, 1277–1282. DOI: http://dx.doi.org/10.1145/3027063.3051137
[12] Guillaume Frechette. 2013. Searching for the self: Early phenomenological accounts of self-consciousness from Lotze to Scheler. International Journal of Philosophical Studies 21, 5 (2013), 654–679.
[13] Jonathan Grudin and Richard Jacques. 2019. Chatbots, Humbots, and the Quest for Artificial General Intelligence. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI ’19). ACM, New York, NY, USA, Article 209, 11 pages. DOI: http://dx.doi.org/10.1145/3290685.3300439
[14] Marc Hassenzahl. 2003. The thing and I: understanding the relationship between user and product. In Funology. Springer, 31–42.
[39] Kennon M Sheldon, Andrew J Elliot, Youngmee Kim, and Tim Kasser. 2001. What is satisfying about satisfying events? Testing 10 candidate psychological needs. Journal of personality and social psychology 80, 2 (2001), 325.

[40] Ben Shneiderman and Pattie Maes. 1997. Direct Manipulation vs. Interface Agents. interactions 4, 6 (Nov. 1997), 42–61. DOI: http://dx.doi.org/10.1145/267505.267514

[41] Edith Stein, Maria Antonia Sondermann, and Maria Antonia Sondermann. 1917. Zum problem der Einfühlung. Verlagsgesellschaft Gerhard Kaffke Aschaffenburg.

[42] Karsten Stueber. 2010. Rediscovering empathy: Agency, folk psychology, and the human sciences. MIT Press.

[43] Ja-Young Sung, Lan Guo, Rebecca E. Grinter, and Henrik I. Christensen. 2007. “My Roomba is Rambo”: Intimate Home Appliances. In Proceedings of the 9th International Conference on Ubiquitous Computing (UbiComp ’07). Springer-Verlag, Berlin, Heidelberg, 145–162. http://dl.acm.org/citation.cfm?id=1771592.1771601

[44] Matthew Thomson, Deborah J MacInnis, and C Whan Park. 2005. The ties that bind: Measuring the strength of consumersâ€™ emotional attachments to brands. Journal of consumer psychology 15, 1 (2005), 77–91.