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The Silent Influence of Designed Things: A Postphenomenological Approach to Embodied Interaction

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Abstract: In this research we aim to establish connections between design decisions on material and interactive qualities of technological artifacts and their influence in concretizing or reframing people's practices. We initiated a Research through Design process in which embodied interaction design is informed by mediation theory to account for technological influence. Taking the mediating characteristics of the smartphone in the practice of photography as building blocks, twenty-six design projects engaged in a process of reframing the possibilities of capturing a life experience through new bodily engagements. An analysis of the design outcomes, contrasted to the smartphone characteristics, revealed important driving design aspects in devices for capturing life experiences that provide a link between physical interaction and meaning-making processes. The paper aims to contribute to recent design movements that approach technology beyond its instrumental qualities, considering its long-term implications in the ways people make sense of the world.

Keywords: Embodied Interaction, Postphenomenology, Technological Mediation, Design Theory, Research Through Design

1 Introduction

The technological advancements of the last several decades have facilitated the assimilation of interactive devices into many aspects of people's everyday lives. These devices, in their current generations, share an utilitarian perspective on technology, in which the role of a technological artifact is to accomplish a given task more quickly and effortlessly. Traditionally, HCI has mostly leaned towards this perspective, popularizing the notion of usability in terms of the fulfillment of a functional goal. However, researchers have pointed out that such a focus on functional objectives and qualities cannot account for the full complexity of human relations with technology, as people do not engage in all activities for the same reasons. Thus, various lines of research have attempted to de-emphasize the instrumental aspect in the design of technological artifacts to underline the ways in which they can materialize different experiential qualities and values, such as tactfulness (D'Olivo et al., 2020), playfulness (Gaver et al., 2004) or slowness (Odom et al., 2019).

The perspective taken in this paper is motivated by these recent movements in the design community, recognizing that, to address the complex influence of technology, designers must focus on more than functional characteristics. To that end, we draw on the principles of *the enriching physical* (Van Campenhout et al., 2019), a perspective on the design of interactive devices that calls for a meaningful integration of digital phenomena over the physical world, in order to appeal to people's bodily capabilities. This approach emphasizes the idea that design should not exclusively seek to enable the fulfilment of an utilitarian goal, but also attend to the bodily engagements that allow people to address the task in order to allow for more diverse values to be materialized when interacting with technology. Hence, in this research we explore the critical role that interactive devices play in how people establish a relationship to their world. To understand that relationship, we implement the principles of the enriching physical through the lens of *technological mediation* (Verbeek, 2005), a perspective in the field of postphenomenology that views technological artifacts as active shapers of human-world relations given their influence over people's perceptions and actions.

This paper presents a explorative account of the compatibility of the enriching physical and the notion of technological mediation with a two-fold objective: 1) to clarify the value of implementing embodied interaction as a way to make interactive products more meaningful, rather than exclusively user-friendly; while 2) pointing to more concrete ways of using postphenomenology as a practical design approach. After presenting the theoretical commitments of this research, we contextualize it by placing it in a concrete design case that allows us to bridge theory and practice: the act of capturing life experiences through the smartphone camera.

2 Background

2.1 The enriching physical and the re-materialization of the digital world

The notion of embodied cognition (Chemero, 2009; Clark, 1997) starts from the perspective that cognitive processes arise from acting and perceiving with a physical body in an environment in which one is immersed. People incorporate and

reorganize resources in the environment as part of their reasoning (e.g. taking up pen and paper to solve a math problem), they augment and transform their sensorial and motor capabilities through tools (e.g. a blind person perceiving their surroundings through a cane) and, by taking action, certain aspects of the world acquire meaning in relation to one's body-in-action (e.g. a handrail is perceived differently by an elderly person walking than for a skilled skater). Hence, brain, body and the environment, and in particular the relations between them, are all considered to be part of the cognitive system (Van Dijk, 2014). However, this crucial role of the physical world in human cognition is not fully leveraged in the current paradigm of technology design, as seen in how smartphones and computers have assimilated various physical objects as digital or on-screen manifestations. This process of *dematerialization* has significant consequences for technology design, since it exchanges expressive interaction routines with physical artifacts for homogenized digital abstractions, such as learned finger gestures in multi-touch displays (Van Campenhout et al., 2016).

Although the dematerialization of products provides limitless flexibility by taking advantage of the digital realm, the loss of physical artifacts signifies the loss of material qualities that appealed to the rich capabilities of human bodies to make sense of the world. Approaching technology design from that perspective places more importance on the outcome of using a product rather than the mechanisms that allow engagement itself, which ultimately frames people's involvement in the world in terms of efficiency. However, previous research has shown that, by themselves, the pragmatic qualities of an artifact (i.e. the role of a product in fulfilling an instrumental goal) do not necessarily contribute to positive user experiences, while hedonic qualities (i.e. beauty and stimulation arising from using the product) have been linked to positive affect and need fulfilment (Hassenzahl et al., 2015; Van Campenhout et al., 2019). Hence, while pragmatic qualities are a functional requirement in a product, by themselves, they do not provide a space where meaningful engagements with the world are allowed to emerge. By guiding the process of dematerialization, *the enriching physical* (Van Campenhout et al., 2019) aims to combine the fluent flexibility of the digital and the richness and persistence of the physical to craft meaningful interactions grounded in the embodied nature of human cognition. Namely, this approach seeks to add a physical dimension to digital events, employing meaningful and expressive body movements that resonate with these events through physical changes, in that way enabling a more attentive and expressive engagement with interactive devices. Therefore, instead of asking how digital information can be physicalized to foster easy and efficient usability, it is critical for designers to consider how the world opens up to the human body in terms of perception and action possibilities, in order to create technological artifacts that materialize different types of values and support the different ways in which a person can "be" in the world.

2.2 Technological mediation and the postphenomenological lens

While embodied cognition theory elucidates the crucial role of technology in situated human activity, the notion of *technological mediation* points at its influence on a larger sociocultural scale. Stemming from the field of postphenomenology, mediation theory focuses on analyzing the role that concrete technological artifacts play in shaping the relationship between people and their world. Verbeek (2005) uses the way in which artifacts steer perception and action possibilities to outline the basis of how this relationship is shaped. First, technology influences human perception by *amplifying* or *reducing* sensorial aspects of reality. Through the specific material and interactive qualities used to direct attention or enable access to world phenomena, a technological artifact determines, not only what people can perceive, but how they can interpret it as well. For instance, observing the moon through a telescope amplifies visual details that are not accessible to the naked eye, yet the moon is presented detached from its context in the night sky, as it is framed by the shape of the eyepiece used to interact with the artifact. On the mediation of action the focus becomes the way in which technology gives shape to people's concrete involvement in the world. Resembling the amplifying-reducing structure when mediating perception, artifacts can also exert influence by *inviting* some actions while *inhibiting* others, which over a period of time concretizes practices and behavior patterns in a given sociocultural context. For example, the microwave enabled a particular course of action regarding food preparation, quickening the process of cooking, which not only fostered a change in eating habits but also altered people's lifestyles by opening time for other activities. In essence, by mediating perception possibilities, technology shapes how the world can present itself to humans and by mediating people's actions it shapes how humans can be present in the world (Verbeek, 2005).

This definition of mediation brings forward a key postphenomenological idea: the non-neutrality of technological artifacts. Since their material and interactive qualities point towards specific possibilities for perception-interpretation and action-involvement; artifacts can reaffirm, disrupt or reframe concrete social practices. Hence, technology mediates, not only people's situated behavior but, the normative frameworks that surround them as well, as it opens new possible courses of action that can potentially challenge current sociocultural understandings (Kudina, 2019). For instance, with the emergence of cameras and their implementation as a surveillance technology, people changed their cultural and legal notions of privacy, opening a reconsideration of what aspects of people's lives are private (Waelen, 2023). For this reason, Verbeek (2011) points out that the design of technology is an inherently moral activity: when people incorporate technology into their lives it will mediate their experiences regardless of whether designers reflected on the moral dimension of their work or not. Therefore, it is crucial for designers to reflect on the ways in which the specific material and interactive qualities of technological artifacts play a mediating role in people's practices and experiences, incorporating that knowledge as a driver in the design process to prospectively address the impact of technology on the way in which people live their lives.

2.3 Summary of theoretical commitments

Considering the affinities shared by the two perspectives, we believe it can be fruitful to combine the key ideas that underline mediation theory with the approach to embodied interaction established by the enriching physical. First, these two perspectives take the possibilities for action and perception enabled by an artifact as fundamental aspects to understand how people can establish a relation to the world through technology. Additionally, neither of these perspectives is concerned with an utilitarian approach to technological artifacts, instead they seek to understand their transformative effects and how they enable different ways to "be" in the world. Pondering the principles of the enriching physical in relation to the notion of technological mediation highlights the role of designers as initiators of values that go beyond pragmatic usability and that ultimately impact how people fundamentally make sense of the world. Therefore, we explore the question of: how can mediation theory provide guidelines in the design of embodied interaction devices to account for the transformative influence that technology exerts on people? The central aim is to get more precise on the connecting space between design decisions on material and interactive qualities and their broader implications for the establishment or reframing of habits and practices.

3 Methods

The research presented in this paper is structured in two phases. In phase one, we adopted the analytical lens of mediation theory to initiate a postphenomenological reflection on the role that the integrated camera of the smartphone has played in reframing photographic practices, specifically understood as the act of "capturing life experiences". In phase two, we initiated a process of Research through Design (RtD), in which theory and practice inform each other in a joint process of designing concrete artifacts and reflection on the knowledge generated (Zimmerman et al., 2007). In this phase, we implemented the mediating characteristics of the smartphone identified in phase one to frame and guide a design assignment concerned with the exploration of novel forms of interactive devices for "capturing life experiences" through embodied interaction. The assignment was carried out by 26 pairs of bachelor students in their 3rd year of design studies. The trajectory of each team lasted 6 weeks, with various iterations that produced one final design and a physical model. All teams received lectures on embodied interaction and a briefing based on the insights of the postphenomenological analysis of the smartphone. Crucially, given the timeframe of the project, the assignment required students to focus exclusively on the mechanisms and interaction routines that would enable the "capturing act" itself (e.g. pressing a button to shoot a picture); a key requirement being that the interaction used to capture content should point to the meaningfulness of the experience and the type of output users would receive (e.g. distorted images, abstract compositions, sound recordings). This constraint leaves out of scope the design of any additional components or platforms used for retrieving the content captured (e.g. social media, a digital photo frame). After a process of reflection and annotation on the 26 resulting designs, we produced a classification that compared the mediating aspects of the smartphone with recurrent interactive and material characteristics in the design outcomes. These contrasts provide useful guidelines for design and a provoking space for reflection, as they reveal different ways in which bodily engagements with "capturing devices" generate a space where meaningfulness can emerge in the experience.

4 An analysis of smartphone photography

We present in this section the most important insights from the postphenomenological analysis on the role that the smartphone has played in the co-constitution of the act of capturing a life experience through its integrated camera, and which served as the foundation for framing the subsequent design projects. Considering the broad practice of personal photography, which is not limited to camera phones, there are several lines that this analysis could have followed; we are interested in the material and interactive qualities of the device that have served as a pathway for a specific access to the world. Of course, we acknowledge that, given the pervasive presence of the smartphone and long history of photography, we cannot unpack the full complexity of the phenomenon in this brief section. However, we believe in the value of engaging in this reflection as a first step towards designing alternative bodily engagements with technology, as it allows us to establish specific characteristics that can be address through design. For this, we focus on the ways in which this device influences people's action and perception possibilities and how these possibilities have consolidated certain ways of "being" in relation to concrete social practices and roles for this technology.

4.1 Immediate availability and engagement

With more than half of the world's population using smartphones to take photos and access social media to view and share them (Kemp, 2021), the practice of photography has become considerably democratized. These devices are now incorporated into every aspect of daily life thanks to its compact dimensions, they can be comfortably carried in people's hands or kept close to their bodies, which means they are constantly available to be used. Additionally, the camera has become such an essential element of a smartphone that people no longer need to unlock their phone to find its dedicated app, all that is needed is a simple finger gesture across the locked screen to immediately access photo-taking functionalities. This overtly functional engagement with the device frames the act of capturing as a task that needs to be solved: when people want to capture a life experience this device provides the most efficient way to do so. By allowing a quicker and simplified deployment, people are perceiving an increasing amount of objects and situations as aspects that can be

potentially photographed. A study on the smartphone photographic practices of young people in Australia (Thomson, 2021) found a high prevalence of objects over other types of depictions in the images produced by participants, indicative of the increasing use of photos for functional reasons, such as remembering information, keeping visual notes about procedures, providing evidence or preserving inspiration. The everyday deployment and immediate availability of smartphone cameras have made people realize that any part of their life experiences can be visually captured. The proliferation of photos depicting visually appealing meals or just unexpected daily situations, exemplify the changing ways of thinking about the use and role of photography in everyday life: every aspect of one's unfolding life has the potential to be a photographic object.

4.2 Visual perception

A wide variety of tools and cultural practices preceded the smartphone as means to externalize personal life as representations outside of the mind, such as diaries and painting. However, each medium has an impact on the aspects of the world that people capture and how they capture it (Van Dijck, 2007). McLuhan (1994) pointed out that, because the physical characteristics of a medium limit the symbolic forms that communication may take, a message is shaped, at least in part, by the medium carrying it. In the 21st century, we have turned from ink and paper towards digital cameras embedded in our communication devices and, as a distinctively visual medium, a camera directs our attention to some aspects of the situation above others. In a study (Barasch et al., 2017) set in a museum exhibit where participants were listening to an audio tour, people who were assigned to taking photos in addition to listening to the exhibit information were more likely to remember visual aspects of the experience, but that came with an impairment towards remembering the information they received in the audio tour. It does not come as a surprise that by heavily focusing on taking photos and visual aspects people are more likely to ignore other type of stimuli, but the aforementioned study is evidence that an important aspect of the smartphone influence is linked to the way in which they redirect our attention.

4.3 Continuous connectivity

Another important characteristic of smartphone photography is how the outcome of the capturing act is dematerialized, resulting in digital pictures that can be leveraged for its networked functionalities. Since the output of capturing through the smartphone is a digital image that people can see right after taking it and decide to keep it or delete it, there is no sense of scarcity anymore, people can take as many pictures as they want and only keep the ones they consider the best. Nowadays, people create vastly more photographs than they share; the study by Thomson (2021) showed a great disparity between the images that were captured or stored by participants (93.5%) and those that were actually shared (6.5%). In addition to this, this digital camera is integrated into a device that not only is conceived primarily as a communication tool, but that is also continuously connected to the internet. This means that, given their dematerialized nature, photos taken with the smartphone acquire a transitory quality to them, there is no perceived need to produce a printed image, they can be distributed or disposed of immediately. The connectivity of a smartphone makes the possibility of instantaneous sharing an inherent characteristic of the photos taken with it, imbuing them with a different kind of meaning: communication and social interaction rather than memory preservation (Van Dijck, 2007). This has been facilitated by the use of social media platforms and their presence as apps in the smartphone, which can efficiently bring the outcome of the device's camera functions into a virtual space for sharing them, taking advantage of the ephemeral nature of digital images for new forms identity assertion (Waelen, 2023). As digital representations of people's selves and their life narratives have become an important part of individual identity formation, the fact that the smartphone functionality emphasizes the shareable potential of photographs has deep implications for how people approach the capturing act in itself (Eliseev and Marsh, 2021).

4.4 Summary

In this section, three characteristics of smartphone photography have taken center stage: its compact dimensions, its focus on visual perception and its sharing capabilities enabled by continuous internet connectivity. With an immediate possibility of access and use, in combination with the dematerialized nature of the content captured, there is less emphasis on the purpose of capturing an experience for preserving a memory that can be revisited, and more importance on sharing what is being lived at a specific moment. Our argument is not that the smartphone is an inherently "bad" device that has turned people into generators and consumers of content, but rather that, because it materializes and perpetuates a specific set of values and practices, people are becoming habituated to navigate every situation through the same set of "rules": quickly, visually and for sharing. However, recording life experiences in itself is an enjoyable process that increases people's engagement with a given situation (Diehl et al., 2016) and, since people want to capture a moment for different reasons in situations with different material and experiential characteristics, it is valuable to develop interactive devices that can support the particular meaningfulness of different experiences. However, a lot of interactive devices are created as a straightforward digitization of previous analogue products or practices with the objective of making them more efficient, even though their predecessors were created with specific forms and interactions that responded to the material constraints posed by the context and technology. Yet, a digital device has a different kind of materiality that can be exploited in its own right, it is not enough to create mere "digital counterparts" of existing products that simply make activities easier and quicker, but to harness the properties of the digital in order to support meaningful interactions. As established by the

enriching physical: we can take advantage of the richness of the physical and the flexibility of the digital for entirely new and meaningful engagements with technology. What would happen to the notion of capturing life experiences if we took advantage of digital technology to introduce entirely new bodily engagements across different contexts?

5 Analysis of design assignments

To elucidate the most important insights derived from the outcomes of the design assignment, we present a limited selection of the resulting concepts that allow us to exemplify our findings, described in Table 1. As was explained in the methods section, these projects were exclusively concerned with the mechanisms that allow the capture of specific aspects of a given experience, which means that this analysis is focused on the "capturing act" itself and not on the retrieval of content. While focusing exclusively on designing the capturing device and not a retrieval method resulted in most devices translating different sensorial aspects into visual content, our priority was to explore how meaningfulness is allowed to emerge in relation to the rich possibilities for action and perception enabled by a given artifact. Hence, our analysis is focused on how the material and interactive qualities of the designs point towards the meaningful experiential qualities of a specific situation. Since a similar exploration could be carried out in the very act of retrieving content, we believe that focusing our exploration only on the "capturing act" still allows us to reflect on the implications of enabling specific action and perception possibilities through an interactive device. Of course, we acknowledge that, given the conceptual nature of the design outcomes, we can only speculate on the way in these devices would influence people in practice. Yet, our objective was not to verify the factuality of their influence, but to move away from thinking with abstract concepts towards using concrete material artifacts to structure a space for reflecting on the ways in which a specific activity can be fundamentally reframed by the design qualities of the technology mediating it.

Table 1. Description of the main functionality and interactions of the design concepts used as examples in this paper.

(A)	DeTailled	The feel of a texture is captured by rolling the device against a surface to translate its roughness into vibrations. The output consist of close-up pictures of the texture and the vibrations generated when rolling the device.
(B)	Di	The device is stretched on the belly of a pregnant woman, showing a circle sized in relation to the stage of the pregnancy. Parents rub on the belly to spread the color of the circle through different expressions, creating a recording of the hand's rub.
(C)	Flow	People select a color that is shown as a "blob" of paint in the device, the rhythm, intensity and speed of one's movements spread the color along its ring shape to create an abstract expression of moving color.
(D)	Inhale	To capture a picture, one must inhale through the device while it is aimed at an objective. The intensity and duration of the inhalation influences the size and color of the pictures.
(E)	Nutriscope	An elongated tool resembling cutlery with a camera on its tip that allows one to take pictures while pressing it against or inserting it into food. The interaction results in a collection of close-up pictures of food.
(F)	TUTO	The "head" of the device is a spinning top that is used to capture videos while playing with it. The way in which the device is spun distorts the image being recorded, creating interesting and funny effects.

5.1 Shaping one's involvement in the world

One key characteristic of the smartphone is the immediate accessibility it allows by virtue of its small dimensions and minimal interactions required. The actions needed to take a picture with a smartphone have become so simplified that they make the process very quick, the capturing is effortless and immediate. However, to achieve this, smartphones make use exclusively of cognitive skills (Djajadiningrat et al., 2007) as the motions required to access the camera and shoot the picture through its multi-touch display are learned gestures with no inherent physical meaningfulness. This pragmatic approach removes any meaningful connection to any specific context, instead becoming a multipurpose artifact that guides people across a wide variety of situations through the same type of rules. The resulting design concepts followed a different strategy. Through their embodied approach to interaction, the actions required to capture the experience were conceptualized to be meaningfully linked to the context of use and the output that the devices generated, in this way mediating and recontextualizing certain practices by introducing the possibility of capturing expressive body movements particular to them.

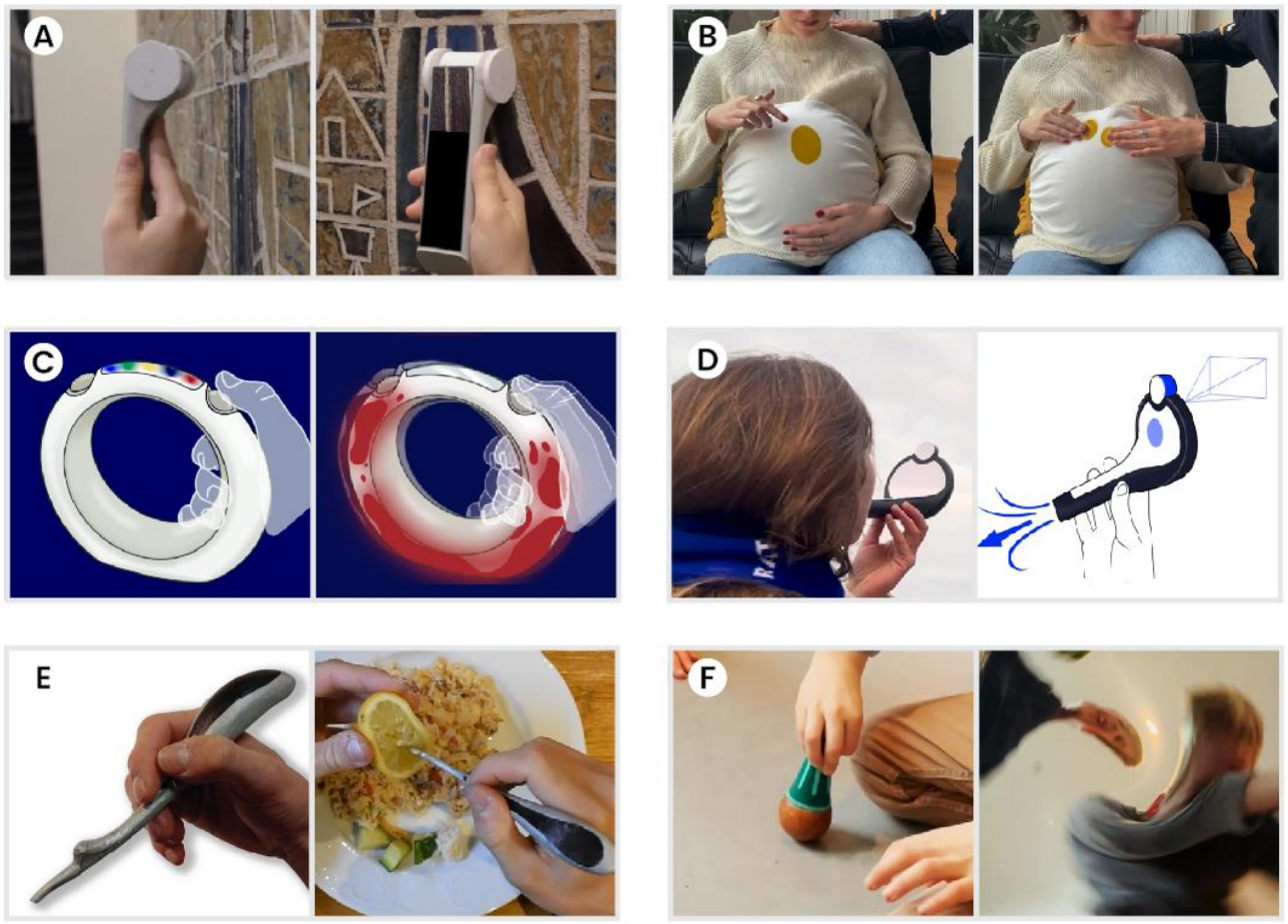

Figure 1. Visualization of the design projects used in this paper.

The designs relied mainly on two strategies to conceptualize embodied engagements with the devices. One approach was to adopt a known practice or action and augment it through the digital-physical qualities of the interactive device. Hence, in the first strategy the artifact mainly builds its meaning upon already formed cultural connotations on the supported activity. For example, in (B) the device presents the possibility for two people to be involved in the capturing, which is done by rubbing on the belly of a pregnant woman (Figure 1B). As the interaction is built around a tactile act associated with closeness and intimacy, engaging with the device brings forth a clear sociocultural significance focused on affection. The materiality of the artifact also points to this social role, special attention was given to the softness of its interface and the device is large and bulky enough for a scarce use that is more akin to an intimate ritual that belongs to the home. Another example of this strategy can be seen in (F), where the main element of the capturing device takes the form of a spinning top, a shape that itself points towards a playful engagement with it given its sociocultural significance as a toy (Figure 1F). To be able to take a video one has to actually spin the artifact, which means that the act of capturing is inescapably intertwined with a ludic activity. A second strategy to the design of interactions was to generate and sustain completely new action possibilities with no concise resemblance to one specific practice. In (C) the user is meant to create an abstract "expression" with color and sound, the process is done by shaking and moving the device to spread the color on its ring shape (Figure 1C). Because a second person can hold the device at the same time and engage in the same process, it enables new types of social coordination to produce an abstract visualization of the "feeling" of the moment. The interaction with this device is built around the coordinated activity of two persons, yet, because it does not resemble an already existing product, it does not imbue the act or output with a strictly predefined meaning. Instead, by providing a new course of action through bodily expressiveness, it creates a space where meaning can emerge from how people make sense of the device and incorporate it into their own personal and social practices.

Of course, this distinction of strategies is not decisively clear-cut. In reality the two strategies can be adopted to different degrees in the design of a single device, the distinction was highlighted because it presents useful guidelines for designers to experiment with. Take for instance (E), the device is meant to document food from a perspective that subverts people's expectations of food photos by focusing, not on visual appearance, but the tangible quality of what lies in one's plate (Figure 1E). To that end, the device clearly exploits a familiarity with cutlery; the thin and elongated shape of the artifact calls for a close and precise engagement: with this device in hand, food affords to be poked, pierced and explored. The artifact, however, inhibits the actual act of eating food. It is the unexpected combination of photo-taking with an "eating

tool" that enables meaning to emerge through the new action possibilities it provides. It capitalizes on people's familiarity with a known act but recontextualizes it through new embodied engagements. In establishing this new type of relation to food the artifact has the potential to establish new types of normativity or change existing value structures, especially considering the pervasive presence of food photos on social media.

5.2 Shaping one's directed attention

By the nature of its purpose, a device for capturing life experiences is meant to be oriented towards specific aspects of a situation in order to record them. Hence, a crucial characteristic of these devices is the type of sensory mode they support, as it will direct one's attention towards a specific set of experiential qualities over others. A camera is a distinctively visual medium which, when combined with the networked functionalities of a smartphone, places a lot of importance in visual presentation. As the design assignment focused on supporting meaningful bodily engagements with a specific situation enabled through the interactive devices, even when visual perception was the main sensory mode used for capturing, it was also often linked to a kinesthetic type of attention during the act of capturing. For instance, in (D) the device uses an interaction that brings awareness to one's own body through a distinctively embodied engagement: the intensity and duration of an inhalation while capturing a photo (Figure 1D). This action can be influenced by several contextual and emotional reasons: the physical exertion for reaching a specific place or the personal significance of being there. In either case, by requiring to capture the experience through this act, the device not only brings attention to what unfolds before one's eyes but also to one's own body as it exists in a specific context. This type of kinesthetic awareness was sometimes the only focus of the capturing devices. A subset of projects were concerned with capturing the "energy" of a moment by producing abstract visualizations created by tracking speed and motion throughout a dynamic experience, such as during a party. A similar instance of this idea can be found in (C) which is not concerned at all with capturing any environmental aspect during an experience, instead using kinesthetic awareness to bring attention to one's subjective interpretation of the moment in order to represent it through color. Finally, only a few projects focused on directing people's attention to tactile and auditory aspects of the environment. Specifically, the focus on tactile aspects provided interesting opportunities to enable engagements with the world. For instance, (A) uses its rolling cylinder as the key mechanism that supports capturing through the device (Figure 1A), which means that to capture a texture, the user has to be able to roll the artifact on a surface. This seemingly restricts the contexts in which the artifact can be deployed, as the physical aspects of the environment need to be attuned to the perception provided by this capturing device.

Another important characteristic of capturing devices is that they are inherently built around a translation process. As has been established, these devices can only capture a limited selection of experiential qualities, which have to be presented back in a specifically designed way. Hence, the output received is never a fully accurate representation of the experience as a whole, but a selective and abstracted version of it. This inescapable degree of abstraction inherent to the "capturing act" generated an interesting tension in the design concepts, between supporting the capture of accurate representations of environmental aspects and providing the means for personal expressions and interpretations of an experience. These two strategies demonstrate the crucial role of the relation between the experiential qualities that are being pointed at and the output that is ultimately received, as it infuses a sense of *directionality* into the devices: in different degrees and combinations, to capture an experience the device can be aimed at *the world* or it can be aimed at *you being in the world*. For example, some projects took a one-to-one approach to the relation between the captured features and the output generated, digitizing, without a significant sense of distortion, sensorial aspects of an experience that would otherwise be difficult to perceive and record, such as the tactile sensation of a rough surface being transformed into vibrations felt through the device (A). However, some projects embraced the inherent process of abstraction in the act of capturing to move away from the notion that people are seizing an indisputably objective representation of the world, to emphasize the idea that one's subjective experience is also an important aspect that can potentially be captured. For instance, as was mentioned before, (C) is clearly not aimed at any specific feature of the environment, instead it requires the user to materialize their own interpretation of a given experience through their embodied engagement with the device, concretizing people's own subjective experience as the objective to be captured. In (B) the act of rubbing the belly to capture the moment effectively positions the intimate physical touch happening between two persons as the experiential aspect that is recorded. Thus, the directionality of the device presents a stark contrast to the way in which a smartphone would allow the documentation of a pregnancy process. Although this design concept provides a visual output that could potentially be shared, the fact that, during the act capturing, the device brings attention to the emotional layer and interpersonal significance of the moment, the outcome seems more aligned with a precious memento that is to be preserved.

6 Discussion

Thus far in this paper we have presented our argument for the compatibility of the enriching physical and mediation theory as a distinctive approach to the design of interactive devices that accounts for the influence of technology in people's lives. We initiated this process by using mediation theory as a way to identify mediating material and interactive qualities that can be readdressed through embodied interaction, in order to establish connections between bodily engagements and experiential meaningfulness. We have produced a design space focused on finding action and perception possibilities that point towards specific strategies to acknowledge technological mediation as a driving aspect in the design of devices for

capturing a life experience. In this way we aim to reframe the value of taking an embodied approach to interaction design and open up new ways of using postphenomenology in a practical way. Next, we discuss the value of our approach in relation to these to objectives.

6.1 Readdressing the value of embodied interaction

In traditional design-thinking processes, designers aim to develop products to unburden people: understanding user's "needs" to produce an adequate solution that makes their lives easier. The approach taken in this research points to a necessary subversion of these type of processes by, instead of exclusively pursuing an functional goal, focusing on how to support and enable ways of "being-in-the-world" through the connections between specific material and interaction strategies and their influence in the concretization of human practices. To shape the meaning and experience that inevitably emerges out of engagement with an artifact, designers need to approach its design by connecting these threads. However, through the traditional approach, many technological artifacts end up requiring very little attention when people engage with them by focusing their attention mostly on the mechanisms that enable a task to be fulfilled, or as Verbeek (2011) puts it: "the product as a material entity has become less important than the function it fulfils." Yet, there are experiential consequences that are inevitable to emerge. The value of embodied interaction then lies in its potential to open up much richer mechanisms for people to generate meaning in their use of technological artifacts by directly appealing to their embodied ways of making sense of the world. This approach resonates with Van Dijk's (2018) reconsideration of the role of the designer of physical-digital artifacts, from someone that establishes the rules that users must follow to complete a task to providing a rich space in which meaning is allowed to emerge. While some of the design concepts used in our analysis built their interactions as a digital instantiation of an already established practice, they avoided establishing concrete interpretations on the bodily engagements that the devices enabled. The design outcomes we have presented explored how to meaningfully connect the bodily engagements required in interaction to the specificity and significance of the context by using action and perception possibilities. In this way, our approach also falls in line with other research that has attempted to establish connections on specific perceptual and action attributes of interaction and the emergence of meaning related to larger sociocultural assemblages (Kimura and Nakajima, 2022; Lenz et al., 2013). Although our analysis has mostly remained speculative up to this point by using only conceptual designs, through this paper we aim to establish a foundation for the next steps in our research, to bring more specificity to these connections through the deployment of embodied interaction devices.

6.2 Finding a practical implementation of postphenomenology

In this research project we have utilized key concepts in mediation theory as drivers in the design process, thus, already pointing at a more practical value for postphenomenology in design. Although, the first step in our process can be seen as a traditional implementation of postphenomenology (i.e. an analysis of an already existing technology), we did so with a distinctive purpose: to uncover the ways in which key aspects of the chosen phenomenon (i.e. capturing life experiences) are mediated by technology, establishing a foundation for the subsequent design process. The notion of disrupting or reframing a known practice has already been established in other design research (Hauser et al., 2018b; Jensen and Aagaard, 2018; Odom et al., 2019), since altering the "rules" of everyday practices can provide insights on the underlying mechanisms that allow these activities to be maintained, including the role of technology in their organization. Our process started by using mediation theory to identify the ways in which an activity is currently constituted by technology, to establish specific aspects that could be addressed in interaction design in order to reframe it. In that sense it has served in the twofold way pointed by Hauser et al. (2018b): as a generative lens to frame the crafting of design artifacts, as well as a framework to analyze empirical findings on them. The enriching physical framework helps open up interesting spaces for reflection by crafting, in a designerly way, artifacts that can be reflected on. While mediation theory provides useful concepts to guide these reflections, informing each other in a way that practice and theory inform each other in RtD. This falls in line with previous literature that has established RtD as an "experimental" way of doing postphenomenology (Hauser et al., 2018a), specifically due to RtD's commitment on the crafting of artifacts for inquiry and the focus of postphenomenology on deriving insights from actual experiences and encounters with technology. Thus far, we have only engaged in one round of design and analysis but the objective is to use the guidelines generated by the design outcomes to inform the development of functional prototypes that allow us to test them in a concrete setting and, hence, provide new empirical data that can be analyzed and challenged through the same postphenomenological lens. Having established a design space through mediation theory, we can craft a specific object of inquiry with clear postphenomenological commitments that both, embodies theoretical concepts and help us further our knowledge.

7 Conclusion

In the design of interactive devices, designers make use of material and computational elements to craft artifacts that allow people to establish a relation to the world. Regardless of the type of approach that the designer takes in this crafting process, there will be experiential consequences that emerge in the use of these artifacts, as a result of the action and perception possibilities that enable the constitution of our presence and interpretation of the world. This perspective highlights the responsibility of designers in their enabling of new ways of "being-in-the-world". It also brings forward the notion that

any designed product is a materialization of values that have the potential to affirm, disrupt or reframe normative practices as an outcome of specific choices in the design process. To address this crucial situation, in this paper we have established the compatibility of the enriching physical and postphenomenology, by presenting them as a distinctive approach to deliberately reframe a known practice through new bodily engagements with technology. We believe that by exploring the underlying connections between interaction strategies and meaning attribution, we can establish new approaches to design that account for more than usability and, instead, address the deep influence and transformative roles that technology has in people's lives. Thus far, we have aimed to establish a foundation for the upcoming stages in our research by presenting clear theoretical commitments that will be carried out throughout it, while adding to the ongoing discussion in the design community over the potential of addressing the development of artifacts beyond their instrumental qualities. Considering the deep influence that technology has over human beings, it is crucial to acknowledge the long-term implications of the development and deployment of any given technological artifact. We hope that this paper is inspiring for the design community regarding the complexity of designing for the wide variety of roles that technology has in people's lives.

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