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HUMAN-THING RELATIONS IN DESIGN: A FRAMEWORK BASED ON POSTPHENOMENOLOGY AND MATERIAL ENGAGEMENT THEORY (1)

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INTRODUCTION

A growing strand in design research has been interested in "new materialist" theoretical approaches (Coole and Frost, 2010) and relational ontologies to study design and use as situated, material interactions within a vitalistic world, borrowing from diverse theorists as Bruno Latour in science and technology studies, Jane Bennett in political theory, and Tim Ingold in anthropology (see recent work by Tönük, 2016; Taylor, 2017; Luscombe, 2018). Such projects correspond with accounts in design, crafts, and Human-Computer Interaction (HCI), where design scholars have utilized phenomenological concepts to deal with questions of perception, embodiment and cognition within research frameworks that prioritize situated, embodied meaning making in designers' and users' interactions with designed things (see for example Nimkulrat, 2009; Kozel, 2011; Dourish, 2001; Loke and Robertson, 2013). As such, we see two theoretical insights converge across design research: On one hand, the agential capacity of material things is widely acknowledged, as they are seen to "mediate" human relations with the world (Latour, 1999; Verbeek, 2005). On the other is an interest in the skilled and embodied character of our engagements with and amongst those things (Bennett, 2010; Ingold, 2011).

One lucid formulation of such a convergence was recently expressed by Don Ihde and Lambros Malafouris (2018) in a joint paper that brings the two scholars' work (postphenomenology and Material Engagement Theory, MET) into dialogue. The authors advocated a unique relational ontology that underlined the "technical mediation" of human experience and capabilities by things through "creative material engagements." We propose that Ihde and Malafouris' joint framework is a viable approach to design research that brings together the two theoretical tendencies we mention above. We particularly emphasize three key aspects: relationality, reciprocal mediation, and creativity in engagement. Drawing on the postphenomenological tradition of outlining specific forms of human-

technology relations (Ihde, 1990), we apply the framework to a series of design-related cases to investigate what the framework can indicate in these, regarding what we call human-thing relations in and around design. In this manner, we aim to assess and identify the specific ways in which it can contribute to design research.

In the following sections, we first present postphenomenology and MET and discuss these theories' relevance for design research; then summarize the main tenets of Ihde and Malafouris' framework. Afterwards we present and analyze three design research cases conducted by the authors of this paper. In the following discussion, we rethink the joint framework from the perspective of design research to specify the characteristics of human-thing relations that we encounter in design: relational, reciprocally mediated, creative and exploratory, situated, embodied, and skilled – with an emphasis on the former three as significant contributions from the joint framework. We finish with an assessment of the theoretical framework developed here for future research.

(POST)PHENOMENOLOGY, MATERIAL ENGAGEMENT, DESIGN RESEARCH

Phenomenology has been called upon across design research; however, its influence has been most evident in HCI as a key component of "third-wave HCI" (Bødker, 2015) with its interest in experience and understanding of interaction as meaningful, embodied and situated action (Harrison et al., 2007). Here, phenomenological arguments and concepts, especially Heideggerian "ready-to-hand" and Maurice Merleau-Ponty's "lived body," have been offered as counterpoints to information-based understandings of interaction. An example is Paul Dourish's (2001) pioneering work on the design of interactive technologies. Another is Dag Svanaes (2000; 2013), who developed an understanding of the body as the active site of experience in human-technology interactions, and later advocated that supporting embodied perception through design makes users able to interact with technology more directly. Such arguments were often presented with a nod to related concerns with embodiment and situated practice in Computer Supported Cooperative Work (CSCW) (Suchman, 1987; Robertson, 1997) and with references to theories of embodied and distributed cognition (Lakoff and Johnson, 1980; Hutchins, 1995). Others used these emergent HCI frameworks to design products and systems from the perspective of tangible and embodied user experience, as with "Moving and Making Strange" design methodology by Loke and Robertson (2013) and "Human Tail Project" by Svanaes and Solheim (2019).

Outside HCI, too, design researchers have adopted phenomenological perspectives to examine their participants' or their own experiences of the world. For studies that employ creative practice as a method of inquiry, as in research through design, phenomenological approaches have helped scholars consider body's involvement in knowledge making (Candy, 2006), and interweave theory with bodily, material practice (Kozel, 2011). Nithikul Nimkulrat (2012, 11), for instance, studied how materials, as experienced by makers, affect the process of making in textile design – considered as "thinking through the hand". Or, Julia Valle-Noronha (2019) adopted a phenomenological approach to investigate the interactions between individuals and their clothes, emphasizing bodily experience rather than visual and cultural dimensions of fashion design.

Postphenomenology builds upon the insights of phenomenology but abandons the latter's essentialist account of experience as well as its romantic stance against technology (Rosenberger and Verbeek, 2015). It is instead interested in accounting for how technologies "mediate" human experience of the world (Ihde, 1990), and how both subjects and objects emerge through that mediation (Verbeek, 2005). While a complete overview is beyond the scope of this paper, we can outline the key human-technology relations as described by postphenomenology: "Embodiment relations" arise when technologies become transparent in their use, as opposed to "hermeneutic relations," where use requires active reading and interpretation. The "transparency" of technology in use, and users' "field of awareness" also affect the relationship, as well as the "multistability" of technologies, i.e. their multiple meanings and uses. (Rosenberger and Verbeek, 2015)

Following Verbeek's early commentaries on design (Verbeek and Kockelkoren, 1998; Verbeek, 2005), postphenomenology has found relevance mainly in HCI. Here, some discussions closely resemble the uses of phenomenology in Third Wave HCI. These use postphenomenological concepts, typically Ihde's (1990) inventory of human-technology relations, to identify design considerations beyond utility (Ohlin and Olson, 2015; Fallman, 2011). Others have adopted research through design to employ and extend the postphenomenological approach. This included nonutilitarian or counter-intuitive objects that put things and their mediating role at the center of inquiry: a slowly rotating coffee table (Hauser et al., 2018), a shape-changing public bench, digital Post-Its (Jensen and Aagaard, 2018), and bowls that communicate with one another in morse code (Wakkary et al., 2017). In another example, Pierce and Paulos (2013) developed a postphenomenological terminology for the study of electric objects, then designed prototypes that propose novel, embodied interactions with electricity.

Overall, uses of postphenomenology in design literature have a typically experimental character and are often distanced from in-depth description. Nor have they been concerned with the creative and co-evolving character of the interactions they study – a dimension that, in Ihde and Malafouris' joint framework, is provided by MET. MET is outlined by archaeologist Malafouris as a theorization of the co-evolution of human minds, bodies, and material culture. Malafouris (2013) brings together theories of "extended cognition" (Clark and Chalmers, 1998; Hutchins, 1995) with those of "material agency" from material culture and actor-network theory (Latour, 1999) to argue that, across human history, human cognition and perception have been shaped through the creative material interactions of the human mind with the affordances of the environments into which it extends. Intention and agency emerge within these interactions, rather than precede action (Malafouris, 2008).

Although MET has only recently attracted design scholars' attention (Aktaş and Mäkelä, 2019), material engagements with the world have been a topic in design research. While references to Ingold (2000) and Bennett (2010) are widespread, both have also been cited by attempts to rethink what design practice consists of. Recent examples include Taylor's (2017) call for a more nuanced understanding of design as open-ended exploration, and Marina's (2020) argument that cooking is an everyday design activity. Similarly, Tönük and Fisher (2020) argued for a "processual" understanding of materials in design practice that goes beyond selecting correct materials

in accordance with user expectations, and instead acknowledges their ongoing engagement with human beings in design and use.

The source of inspiration for this paper, Ihde and Malafouris (2018) have recently proposed the complementarity of postphenomenology and MET. This is despite the former's interest in novel, predominantly digital technologies as opposed to the latter's focus on older technology across longer periods. The combined framework advocates a relational ontology that emphasizes the entanglement of human beings and things, and their reciprocal mediation across different scales of time, from contemporary technological developments to changes across archaeological eras. The postphenomenological concept of "technical mediation" is central to this specific take on relationality, for it helps conceptualize the way both human experience and capacities are shaped by things. The MET concept of "creative material engagement" is equally key, for it describes that this shaping takes place through active, dialogic bodily engagements with the world.

As we review above, design literature has worked with both postphenomenological concepts and issues of material engagement. In the former, phenomenology's focus on experience, combined with an interest in describing forms of technical mediation, has been helpful to design and HCI researchers for working with diverse interactions that are not necessarily immediately utilitarian. The latter's focus has been on entanglements of humans and things in practice. Though underutilized, we find MET's stress on creative character of engagement to be particularly salient. By proposing the joint framework for design research, we thus argue for the complementarity of these two strands of research. We find the framework is fit for the task for its following three aspects: relationality, reciprocal mediation, and creativity in engagement. In the rest of the paper, we demonstrate the significance of the framework and especially these three terms.

CASES

The empirical basis for this paper is constituted by three design research cases that investigate three diverse practices: felt making, make-up, and studio camera operation. These were selected out of seven projects that are by the authors of this paper, who were brought together in an open-call workshop at Middle East Technical University in Ankara to discuss postphenomenology and MET in relation to their own research projects (for an overview of the projects, see **Table 1**). The remaining four cases were concerned with amateur computer repair, maker practices, text production, and GPS navigation. While diverse in their questions and approaches, as well as levels of progress, all case studies shared a commitment to relationality and a general concern with issues of technical mediation, embodiment, and creative material engagement. The analysis of the cases involved the workshop, and a series of online meetings to identify common threads and highlight differences in light of the joint theoretical framework. Guiding questions included the types of human-thing relations that emerge in the practices; how creativity appears differently; the couplings of the body with materials, tools, other bodies, and the environment; and what the outcome of the practice comprises. The wide range of cases illustrated the extent to which experience and engagement can be studied with relevance to design research.

	Practice studied	Research focus	Research methods	Participants
Bilge Merve Aktaş	felt making	material's role in felt making process	practice-led, participant observation	expert craftspeople, novice makers, the researcher herself
Tuğba Tok	make-up	creative engagement and embodiment with make-up tools	non-participant observation, interview	professional make-up artists
Betül Gürtekin	studio camera operation	embodiment processes of camera operators	auto-ethnography, participant observation, interview	studio camera operators, including the researcher herself
Ayşegül Özçelik	amateur computer repair	interactions with the inside of computers	interview, think-aloud sessions	amateur computer repairers
Özgün Dilek	maker practices	agencies in maker practices	interview, observation	makers
Fazıl Akın	text production	text production technologies as mediators of perception	historical analysis	-
Elif Büyükkeçeci	GPS navigation	Drivers' experience of their immediate surroundings	participant observation	drivers

Table 1. Overview of the seven design research cases

To conduct an in-depth analysis and discussion, we sampled three cases. The sampling was selected to represent the variations in the seven projects. The selected cases correspond to three different levels in terms of both the technical complexity of the mediating technologies and the relevance of the immediate interpersonal context to the studied practices. The sampling was selected also to highlight the central tenets of the seven projects to the fullest extent: They reveal the complexity of the materiality that is involved in these practices, and value the role of the social and material relations as equally crucial for the emergence of these practices: Bilge Merve Aktaş studied felt making, and rather than examining how a maker comes up with an idea and produces an artefact, she examined how material transforms from being part of a sheep to becoming an entangled form. Similarly, Tuğba Tok examined make-up practice, not from the perspective of cultural representation but from the perspective of material engagement. And Betül Gürtekin examined the multi-layered and collective embodiment of a studio camera operator with a focus on the momentary coming-together of the operator, camera, other crew members, and other things in the studio environment.

The following section provides a detailed presentation and analysis of the cases by referring to data that each researcher collected through their field visits and autoethnographic accounts.

Felt Making

Aktaş has used interviews, participant observation, practice-led research and workshop design as methods to look into felt making, a small-scale studio practice that relies on entangling wool fibers to create a textile surface (Aktaş, 2020). Her examination of material's agency in the making

processes draws from MET to examine the coupling of the body and material through interactions.

While making felt, the body moves the fibers back and forth to create a unified surface (**Figure 1**). Several elements contribute to the process. The first of these is the material. Contemporary practitioners often work with processed wool as opposed to raw wool, whose manipulation requires more time. The entangling of the raw wool fibres is also not as uniform, since its fibers do not go through a disentangling process as with processed wool. Aktaş's fieldwork also revealed that the living environment and breed of sheep, as well as the body part from where the wool is collected, affect softness, stiffness, and thickness of fibers. Following the arguments that materials are not "givens" of processes, but active participants, which embed vitalities (Bennett, 2010), Aktaş's examinations of the human-material interaction indicates that the making process starts being shaped before any design decision of the maker, as an impact of the active life of the material.

Aktaş's research documented felting by hand and with tools by visiting felting studios and industrial producers. Tools range from simple needles that are recent innovations, to fully automated production. The processes and outcomes of these significantly differ from each other, and shape makers' relationship with and closeness to the material. Following postphenomenological accounts of human-technology-world relations (Ihde 1990), it can be argued that different technologies of felting bring different interaction models and diverse forms of mediation. With a felting needle, tool becomes an extension of the hand, and form is created through wool-needle-hand interactions (an "embodiment relation"), whereas in semi-industrial production, the interaction between the material and the body is limited to the phases before and after entangling fibres, as the machine, the tool, does a significant amount of entangling work through becoming an intermediatory between the body and the material. Finally, in fully automated production, makers interact mostly with intermediary tools such as computer software that translates ideas to machine language, and the material interaction happens only after the production where the material becomes an artefact. Here, a "hermeneutic relation" tends to override "embodiment relations" since the maker develops design decisions with the representations of their ideas through the software; but

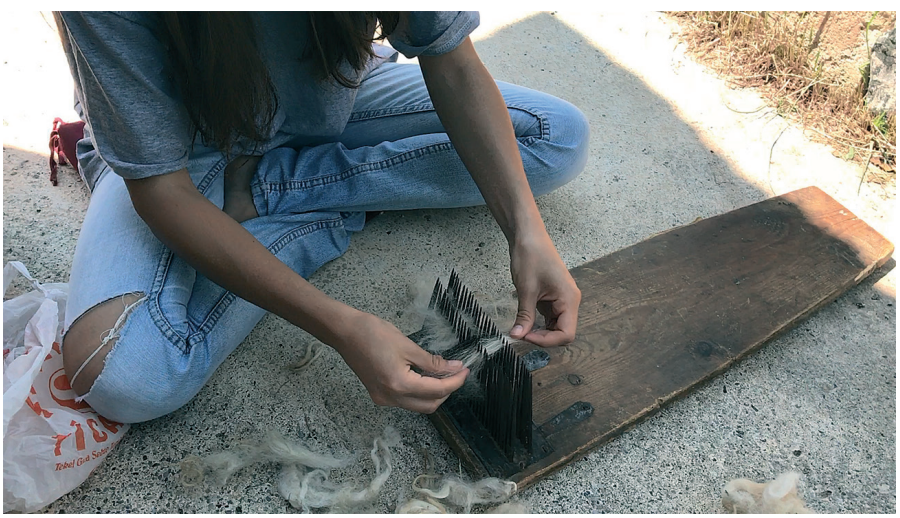

Figure 1. Felting is a way of entangling wool fibres to create a nonwoven textile.

embodiment still takes place im-materially and shapes the intentions of the maker.

Building on the idea that any entity is active in their own situated way, the making environment also mediates the interaction between the maker and the material: For instance, felt makers that Aktaş interviewed preferred to work in warmer seasons when heat shortens the making process.

Reviewing different ways of felting indicates that making unfolds in various ways depending on how the maker relates to the material, tools, and making processes, and under which conditions. In various engagements with the material, it gains various roles and actively impacts the ideas that the maker develops. This can generate unexpected situations that guide the evolution of the interaction. In turn, knowing that working with the material can bring unexpected situations, makers gain a sense of openness for changing their initial plans while developing skills for quickly adapting to such changes. Even though all creative practice starts with intentions, both the process and the results are often different from the initial ideas. The material continuously and actively transforms itself, the process of making, and the maker who is simultaneously transforming the material. In this reciprocally transformative interaction, tools mediate the process, makers mediate the material, and material mediates the maker. Human and material entangle in an active and dynamic relationship – a dialogue – through which an artefact co-emerges (Aktaş, 2019; Malafouris, 2008).

This dialogue occurs in the "lifeworld" – hence the phenomenological idea that humans are inseparably connected to the environment they live and experience in (Husserl, 1936). Makers think in the extended space that they are part of. From the embodied cognition perspective, humans make sense of their decisions, plans, experiences, and material interactions not merely in their brains but through situated engagement (Johnson, 2007). This is how making allows for personal and practice-related growth (Ingold, 2013). For instance, Aktaş's findings indicate that experiencing the agency of the material and the environment can transform the maker. As she followed the material not only in studios but also in sheep farms, this led to changes in her perception of the practice and the material. This also includes how being with sheep affected her understanding of the lifecycle of the material and its ongoing transformation even without human presence. The material will continue making an impact on surrounding material engagements not only in making, but also in everyday situations – a continual flux that continually shapes humans and things. Following what Ihde and Malafouris suggest (2018), recognizing and discussing these mediated interactions as creative material engagements can reveal alternative ways of being and doing for humans at large.

Make-Up

Tok's study has explored make-up as continuous reflexive engagement with make-up products, equipment, and the practice environment, using MET and the works of Ingold as a theoretical framework, indicating the reciprocal transformations between maker, tools, and materials. The study is based on an interview with and observations on a professional make-up artist while he applied bridal make-up on a client (**Figure 2**).

Tok's study documented the diversity of make-up tools and materials, and the skill and know-how required to use them. There are various types of make-up products to apply at different parts of the face, which come in

Figure 2. Make-up tools used by the artist.

different formulas, chemical states, and pigmentation levels. Furthermore, the properties of a product such as color, texture, fluidity, and opaqueness may appear on the skin unlike how they seem on the pan. Make-up tools, such as brushes, sponges, even tweezers, also have specific uses in combination with specific materials, and diverse ways to apply them – e.g., angles, lines, pressure, or repetitions. An example is the fan brush, which is used to highlight higher points on the face such as cheekbones. However, the artist that Tok observed used it to contour the hollows of the cheeks, to darken the shadows. He pointed out that, when his fellow make-up artist had recommended this "make-up trick", he had not been convinced at all, but was surprised when he experienced it. Thus, the recognition of the purpose of a tool and its mode of operation can also be interpreted as an extended cognitive process.

Tools do create opportunities for active material engagement (Malafouris, 2013, 169). But sometimes the tool delivers quite differently from the maker's expectations, and sometimes the tool hides the material – for instance, when he could not see the make-up product's actual color on the tip of the brush. The practice here not only belongs to the artist or the product but equally to the enactment of the brush's blending movements (Ingold, 2011). Postphenomenologists call these situations "embodiment relations," where the tool retreats from consciousness and forms a unity in action (Ihde, 1990). Indeed, there were movements the artist executed out of habit, without even noticing. For instance, he often stopped to look at the mirror to make a quick check to compare the results from a different distance and light. In this manner, he also evaluated the outcome: The image in the mirror would better resemble how the make-up would look in wedding photos than what he sees in closer contact. During the interview, the artist stated that results usually differ from what he envisioned at the start, though not dramatically. He was aware that he was not the only contributor to the outcome. In the process of make-up application, this can be interpreted as the "reciprocal causation" (Malafouris, 2013): Each element of the practice transforms the sequence, and therefore the outcome.

Although visibly transformed by the practice, the client is hardly a blank canvas, since her skin conditions can alter the process as much as other external factors such as light or temperature. Beyond what Aktaş mentions above as the influence of environment, this further includes the influence

of the projected use context of make-up; in this case, a day-long bridal ceremony. The differences between indoor or outdoor events, editorial shootings, or private celebrations alter the creative execution of the make-up artist. Moreover, this change occurs due to not only contextual differences but also physical conditions and chemical properties of the selected make-up products. Rather like Aktaş's emphasis on the active participation and liveliness of the material, even after the application is finished, chemical reactions keep taking place. Consequently, how the final make-up looks is not solely determined by the client's request or the make-up artist's creative vision.

The make-up artist followed a plan; however, this plan was in constant change: Sometimes, he deliberately changed his mind; sometimes, his client interrupted him; sometimes, the product or the tool did not work as he expected. His course of action did not consist of a linear path, e.g. brush-pan-skin, but followed a more complex sequence. Starting from the delegation of his finger's skill to brushes to obtain precision, going through the diversity of make-up products, selecting a few, mixing the colors, adding more, removing, building up, quick check, looking at the mirror, going back again, talking to the quests, reassuring the bride, cleaning up the brushes – a "wayfaring" type of movement, where each "in-between" creates another interaction (Ingold, 2011, 163). In parallel with Aktaş's statement that making is a dialogue, through this navigation, the dialogue of the maker, material, and tools are in motion within the environment.

Studio Camera Operation

A camera operator herself, Gürtekin has used autoethnography, observations, and in-depth interviews to investigate camera operators in multicamera systems used in TV studios (Gürtekin and Kaygan, 2018) Using phenomenological theory, she analyzed the bodily techniques of camera operation as multi-layered embodiment processes in the interactions of a skilled user – operator – and a designed product – camera – within the multicamera system in broadcasting context, considered as a "lifeworld." As discussed here, MET offers a complementary perspective that addresses the togetherness and active involvement of participants, and their creative and explorative co-engagement.

The camera operator's performance indicates how product use can become operating, experiencing, making and mediating (**Figure 3**). The operator is in an embodied interaction, focused on the task instead of the product. The camera withdraws from experience and becomes transparent, while the operator's attention is on the visual image. As narrated in the researcher's interviews with camera operators, the focal point for a camera operator is to achieve a visual image that is "aesthetic" and conforms to broadcasting norms. For that, the operator puts into play her occupational experience, skill, creativity, reflexes, interest, knowledge, expertise, and situational awareness. This can be understood from the perspective of MET as actively engaging with the materials, tools, and the environment and expressing bodily responses to what the environment offers and how through engaging in such situations the practitioner become more experienced (Malafouris, 2014). As she gains experience and expertise, the operator becomes more reliant on her embodied knowledge, to the extent that she becomes one (Ingold, 2013) with the mediating technology and the context she experiences in: She feels the technology as a part of her body, and she feels as if she is a part of the technical environment.

Figure 3. Camera operation as skilled practice.

User and product are not only intertwined in the former's experience, but also co-shaped in practice. Following Aktaş's insights, they are in a constant "dialogue," which makes the process ever dynamic. Gürtekin's findings reveal that an experienced camera operator executes smoother camera movements than a novice, whereas a tripod limits the movements of the camera more than a pneumatic pedestal does. In that regard, the camera and other technical equipment are not mere objects manipulated by the operator for producing a desired image; they are the active participants of an embodiment process, as the result of which the visual image is co-created.

Apart from the materiality of a specific product or tool, as in felt making and make-up, camera operation engages with the whole context. The operator works as part of a camera crew and more broadly within a broadcasting crew in a specific program setting such as news or a concert. Her operation is structured by a mesh of interactions within these environments, while she is tasked with creating an image on her camera by utilizing its hardware, software, accessories, and supporting systems. For instance, her body and camera movements and framing intentions in a music program differ significantly from those in a football match, even if she operates the same camera system: In a music program she follows the music and synchronizes her movements along with it, as music shapes her embodiment process. However, in a football match, her priority is to keep the ball in the frame and her embodiment is entangled with players' movements. Besides, her intentions and performance differ according to her camera position and specific task in the team even in the same program context.

The environment also includes the sociality of the operator's lifeworld. Gürtekin's fieldwork shows that the camera operator's significant initiative and creativity with regard to composition and camera movement, are shaped by the orders from the director in a hierarchical relationship. The operator also takes part in collaborative engagements with other crew members: For example, if another cameraperson fails to capture a

particular image, she may need to reposition herself to catch that image (Gürtekin and Kaygan, 2018). Through collective decision making and action taking, the shared objective of the broadcasting crew to capture an intended image, shapes the embodiment process of a camera operator. Decision and action are in this sense distributed among the crew and the technologies.

As such, a studio camera operator stands in the middle of countless relations. She plans her action according to her own capacity, her interactions with the director and other broadcasting crew, and the requirements of the program context, as well as the shooting environment and the camera she operates. During the action, however, she will adapt in a skilled manner, as Gürtekin's fieldwork showed, e.g., according to an immediate order coming from the director, a spontaneous technical problem, or an unanticipated development in the program. Overall, the final image on the camera is not a product of intention, but co-shaped and constantly transformed.

DISCUSSION OF THE FINDINGS

All three cases identify embodied practices in creative engagement with materials and tools, which emerge in distributed ways and through mediations. With this discussion, not only are we questioning the transformation of phenomenological experiences in the mediation of technologies, but we are simultaneously interested in how human beings are shaped by their dialogic interactions with the world across diverse creative material engagements that take place in design, making and use. In this section, we first summarize and discuss our findings from our analysis above, then from the more general perspective, identify the six characteristics of emergent relations that are called for from the perspective of the joint framework.

These three cases show that although we describe our engagements as singular practices, such as felting, make-up, or using a camera, they involve complex, multilayered interactions, in that even simple practices that seem to be taking place between one maker and a single material are built on complex relations that are interdependent on several humans and nonhumans.

Out of the creative interrelationship between humans, materials, tools, and the environment, an outcome emerges: This can be a new felt product, a painted face, or a TV program, as well as new insights, experiences, or knowledge. The emergent relations shape new experiences, interactions, and practices. While making, the artefact emerges from the dialogue between maker and material (Mäkelä, 2016). Although the maker starts with intentions in every contact with the material, these intentions are transformed across the process. Therefore, making is simultaneously an active, creative engagement, since, in order to reach the desired outcome, the maker keeps in constant bodily dialogue with circumstances at the scene, reacting to spontaneous changes and requests from the active elements in the environment (Aktaş and Mäkelä, 2019). The outcome cannot be known entirely beforehand; however, skillful practice entails responsiveness and anticipation.

For instance, in felt making the most obvious dialogue is between the maker and the material, however, once the maker embodies the sense of building a dialogue with the material, they also realize that the making

environment and the tools directly shape how to engage with the material: Working with a felting needle requires no specific space, while semi-industrial machines require a studio, and the industrial machines require a factory. On the other hand, in camera operation, the engagement is more holistic in the sense that it requires situational awareness in the environment: The dialogue responds to the spontaneous combinations at the environment, and this requires making quick decisions and adapting to changing conditions promptly.

In any case, the outcome is never really a fixed and finalized entity. Rather it continues becoming its new versions with or without human presence, in relation to factors such as heat, friction or light, and within the novel situations it enters. As **Figure 4** illustrates, the elements that we examined, namely humans, materials, tools, and the making environment exist in relation to each other while carrying meaning and significance both spatially and temporally beyond that particular practice. This means that the dialogue also depends on how human beings, materials, tools, and the making environment emerge and engage with the external environment, or the world in general.

As such, our examination indicates the centrality of emergent relations and relationality in practice. Next, we list and unpack the characteristics of these relations.

SIX CHARACTERISTICS OF THE EMERGENT RELATIONS

The research cases that we studied revealed various types of relations that can be found in creative practices in and around design. These indicate that employing MET and postphenomenology as theoretical approaches provide an understanding of design that builds relations that are relational, reciprocally mediated, creative and exploratory, situated, embodied, and skilled. The latter three of these six characteristics are relatively ubiquitous across design research, as indicated by our literature review above. We have instead emphasized the first three in our discussion above, as they are more central as contributions of the joint framework to design research. Furthermore, in the following, we refer to all seven cases (see Table 1) as examples to provide a more evocative explication.

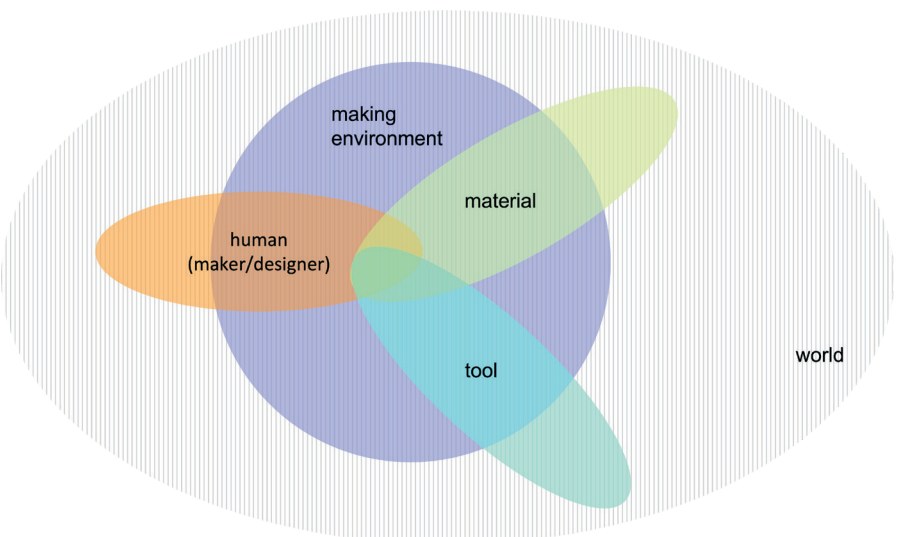

Figure 4. Human-thing relations.

The elements in the social and material situations in which design and use are practiced impact how our experiences emerge over time. Particularly in making processes, the material environment, which includes the materials, tools, and other artefacts, significantly impacts the emergence and development of the engagement processes as well as the outcome artefact. This impacts how we consider and reconsider our thoughts and intentions, how we articulate our bodily movements, how we execute our bodily techniques, and overall, how we perform an action. A further example can be found in maker communities, where maker spaces (viewed together with user guides, tutorial websites, online forums, as well as components such as breadboards, sensors, motors, cables) shape whole communities of users and their collective knowledge and shared practices (based on Dilek's fieldwork; see also Dilek, 2020). Different materialities enable different types of interactions and thus shape the ways in which we experience and think about, and act in the world. As such, our making and using experiences are relational**.** Moreover, not only the tools and materials but also other individuals, groups, and even nonhuman animals can be part of the relationality of the practice.

However, the materiality of our environment also continuously changes. These transformations can be led by human agency or nonhuman forces (see also Ingold, 2013). Our interactions are entangled with these changing material and social circumstances: They are, as such, situated (Suchman, 1987): Even repeated actions can be different each time in response to environmental conditions.

In these situated engagements, reciprocal mediations take place between humans and nonhumans: While humans alter nonhumans, such as through shaping materials into products, they are also reshaped as persons by gaining new experiences, skills, and embodied knowledge and capacities, and socially by forming interpersonal relationships and communities. Such changes occur because things around us have agency: Technologies afford certain interactions more than others and mediate our relationship to the world, to other humans and things (Verbeek, 2005). For example, whether we navigate a city with or without a GPS device changes how we experience and interact with its people and spaces (based on Büyükkeçeci's fieldwork).

As we make sense of the world through multi-sensorial experiences within our environments, our practices are embodied in the emerging situations. We embody materials, tools, products and the world to the extent that we are bodily connected to them. They become transparent, but not neutral, extensions of our body so that we can focus substantially on the process and think with these entities that we are placed in a relation with.

Through embodied engagements with affordances, human-technology relations also generate skilled practices. Although we gain our skills through imitation and repetition (Ingold, 2011), these skilled bodily movements are not merely mechanical and functional, but also emotional and expressional (Jensen, 2005). As with the camera operator, another example could be found in amateur repairers, who routinely use diverse tools: screwdrivers, prying tools, tweezers, soldering iron, as well as plastic cards to open cases, and toothbrushes to clean dusty fans. Using such tools – sometimes high-end, sometimes crude – on the sensitive hardware requires bodily skills, including a certain delicacy, patience, and precision, which indicate superior embodiment (based on Özçelik's fieldwork, see also Özçelik, 2020; Özçelik and Kaygan, 2021).

The relational experience thus reveals the skillful patterns of the human body as it gives instant responses to situations. Other things around us continually shape our interactions in a way that dynamically forces us to recalibrate our movements and re-evaluate our ideas and intentions. Therefore, skilled practice requires being attentive as well as responsive to the transformations happening in one's environment. Our experiences typically emerge spontaneously, and they are dynamic rather than static, and our engagements are creative and exploratory. An example similar to make-up is the GPS user, whose driving experience is guided by her following the live map view on the screen of her device, combined – or in contrast (Besmer, 2014) – with the extent of attention she pays to the view of the road through the windscreen (based on Büyükkeçeci's fieldwork). Every action creates and blends into another interaction in an explorative and improvisatory manner (Ingold, 2011). The body leads this creative and explorative process through perception and re-interpretation of sensorial information.

CONCLUSION

In this paper, inspired by Don Ihde and Lambros Malafouris's exposition on the possibility of a joint theoretical framework of postphenomenology and MET, we investigated how we might understand design through the complementary lens of the two theories. The joint framework brings together the idea of "technical mediation" in contemporary technologies and "creative material engagement" across archaeological eras, which we utilized and reinterpreted from the perspective of design research into instances of design, making, and use. For that, we presented and reanalyzed three cases in detail, out of an inventory of seven cases committed to the study of emergent relations in creative, embodied, and skilled practice with an interest in ethnographic detail. Our discussion demonstrated that diverse and complex relations make up such practices, where humans relate to the world in ways that are reciprocally mediated, creative and explorative.

Having described, interrelated and elaborated a diversity of human-thing relations in this manner, we contribute to the design literature a specific framework through which insights from postphenomenology and MET can be employed to examine our multi-dimensional relationship with the world in design, making, and use within diverse product milieu. As noted previously, this is in line with recent interests in relocating design and use in relational terms: Marenko (2014), for instance, indicated the animistic tendencies in Internet of Things. As another example, a recent paper by Taylor (2017) called for a rethinking of design as expanding our capacities within the world with reference to Ingold's work. Participatory Design scholars have been, for the last decade, interested in Latour's formulation of "thinging" to ground their practice (Björgvinsson et al., 2012; Latour, 2005). This paper does owe to these and other similar work cited in this paper for the ongoing interest in relational ontologies and situated, embodied practices. Yet we follow an alternative path, based on postphenomenology and MET, and therefore focused on questions of experience and engagement amongst material things.

From the broader perspective, the relational perspective proposed here can inform the field of design from two angles. Firstly, it can prioritize the experiential investigations during the design processes in which different technologies, materials, and tools affect the development of

design concepts. In this case, these theoretical approaches can enhance methodologies that significantly rely on practitioners' reflections and personal experiences as valid sources of information during the design processes. In these, the variety of relations we identified can work as a comprehensive yet flexible framework. Indeed, the rich empirical data that we show in this paper indicates that such theoretical frameworks can be applied to a wide range of cases and questions to tackle diverse design practices and use experiences.

Secondly, the joint framework can inform us about the relations between design outcomes and the use phase. A possible use could of course be better anticipation of use contexts for designers, through attention to the emergent relations amongst the various entities in material interaction. More importantly from the standpoint of these studies, the theoretical approach we advocate here can provide an understanding of both design and use phases as inseparable: as world-shaping experiences emerging through relations with materials, tools, technologies, and the world. Focusing on the co-development of humans, materials, and technologies can underline our existence, as both designers and human beings, in the world amongst the entanglement of diverse beings.

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Anahtar Sözcükler: Karşılıklı dolayım; yerleşik pratik; bedensellik; yapıp etme; tasarım teorisi

TASARIMDA İNSAN VE ŞEY İLİŞKİLERİ: POSTFENOMENOLOJİ VE MADDİ ETKİLEŞİM TEORİSİ ÜZERİNE KURULU BİR TEORİK ÇERÇEVE

Teknoloji felsefesi alanındaki postfenomenoloji çalışmaları, Don Ihde'nin erken dönemdeki araştırmalarından başlayarak teknolojilerin, insanların dünya ile ilişkilerine hangi yollarla şekil verdiğini tespit etmekle ilgilendi.

Daha yakın bir tarihte, bilişsel arkeoloji alanından Maddi Etkileşim Teorisi (*Material Engagement Theory*, MET) insanın dünya ile girdiği yaratıcı ve maddi etkileşimlerin, insani düşünceye ve diğer insan yetilerine nasıl şekil verdiğini tarif etmeyi amaçlıyor. Yakın zamanda Ihde ve Malafouris'in (2018) iki teoriyi iletişime geçirdi. İki yazarın ortak çalışmaları üzerine kurulan bu araştırma, bu ortak çerçeveyi, tasarım alan yazınında ilişkisel ontolojilere ve bedensel etkileşime yönelik yükselen ilgiyle bir araya getirmeyi hedefliyor. Araştırma, malzemelerle ve araçlarla yaratıcı etkileşimler içeren farklı pratikleri inceleyen yedi farklı vaka çalışmasından faydalanırken, bunlardan üç tanesine odaklanır: keçe yapımı, makyaj, stüdyo kamerası kullanımı. Araştırmada vakalar, tasarım alanında gözlemlenebilen insan ve şey ilişkilerinin farklı biçimlerini tespit etmek ve tartışmak amacıyla ortak teorik çerçeveden yeniden analiz edildi. Bulgularımıza göre, bu tür ilişkiler, yaratıcıdır ve keşif içerir; maddi ve sosyal olarak ilişkiseldir; çift taraflı olarak dönüştürücüdür; bir konuma hastır; bedenseldir; beceri içerir. Ortak çerçevenin, tasarım araştırmalarında tasarıma, yapıp etmeye ve kullanıma dair anlayışımıza katkısı açısından bu altı özellikten üçünü öne çıkarıyoruz: ilişkisellik, insan ve şey ilişkisinin çift taraflı olarak şekillendirici olması ve etkileşimlerin yaratıcı karakteri. Yazının sonuç kısmı bu bileşik teorik çerçevenin tasarım araştırmaları açısından sunduğu olasılıkları tartışıyor.

HUMAN-THING RELATIONS IN DESIGN: A FRAMEWORK BASED ON POSTPHENOMENOLOGY AND MATERIAL ENGAGEMENT THEORY

Starting with the earlier work of Don Ihde, postphenomenological studies in philosophy of technology have been documenting the many ways in which technologies shape human beings' relationship to the world. More recently, Material Engagement Theory (MET), originating from cognitive archaeology, offers descriptions of how human thinking and capacities have been shaped through creative material engagements with the world. Based on a recent collaboration by Ihde and Malafouris (2018), this study applies the joint framework of postphenomenology and MET to design research in light of the rising interest in design literature into relational ontologies and embodied practices. The study is built on data from seven case studies of practices in creative engagement with materials and tools, three out of which are reviewed in depth, namely: felt making, make-up, studio camera operation. The cases are analyzed through the joint theoretical lens to identify and describe the human-thing relations as observed in design. We describe such relations as creative and exploratory, materially and socially relational, reciprocally mediated, situated, embodied, and skilled. Our emphasis is on the first three of these six characteristics, emphasizing relationality, reciprocal mediation, and creativity in engagement, as significant contributions of the joint framework to understanding design, making and use in design research. Our conclusion includes a discussion of future research opportunities for studies based on the joint framework.

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