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Sociomaterial Quasi-objects: From Interface to Experience

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Abstract:

In this paper, I examine design practices by contrasting the Cartesian view of separation with an ontological perspective and argue for a dynamic, multiple, and entangled world (namely, sociomateriality). In the digital era we live in, sociomateriality helps move design practices forward in order to embrace constant changes and re-configurations. The word *interface* manifests a worldview of separation. Researchers typically conceive an interface as belonging to an artifact; that is, the technology, the material. More so, [people] typically considers user interfaces as the layer that separates and connects the technology and the user, which enables interaction. I recognize the limitations of the well-established perspective of interface design and contrast two traditional HCI concepts (namely, usability and context) from a Cartesian versus a sociomaterial perspective. However, to embrace and capitalize on the emergent digital reality, we need a new vocabulary. I introduce helpful concepts that one can use when designing and talking about experiences, and I ground the concepts in a sociomaterial ontological perspective. The concepts and design approach presented in this paper invite and encourage researchers to focus on experiences as sociomaterial entanglements and re-configurations and not as separated social and material entities. By using Michel Serres' (1980) term *quasi-objects*, I call attention to the complexity of sociomaterial entanglements that make up experiences and emphasize a holistic and inclusive design approach. In addition, introducing sociomaterial concepts, such as agential cuts and intra-actions, into the human-computer interaction domain invites researchers to think and act in new ways in the era of digitalized experiences. I examine the benefits of the sociomaterial design approach and present practical guidelines on how to approach experiential design with a sociomaterial take.

Keywords: Philosophy, Sociomateriality, Interface Design, Experience Design.

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1 Introduction

Traditionally, when designing digital artifacts, one spends much time on how to make the artifact usable and/or context sensitive and on how to implement certain “properties” into the technology (Nielsen & Hackos, 1993; Norman, 2013; Riemer & Vehring, 2010). Interaction designers and companies spend lots of resources on user interface development to make the interaction between the user and the technology smooth, interesting, or fun depending on what the producer wants the user to do, feel, and experience. Yet, with this traditional view comes a distinct Cartesian separation between the technology and the user (Riemer & Johnston, 2014) that helps designers dedicate certain qualities to the technology and others to the user. This separation of different entities (i.e., the user (the social) and the technology/artifact (the material)) facilitates an ontological view of the world that isolates users from the technology they interact with. This way of separating between artifact and the user has been efficient for many technological solutions. Indeed, Shneiderman and Plaisant (2005) argue that one can see the effects of a good user interface all the way up to Wall Street; if the user interface of an artifact is good, it will sell.

In other words, current literature about interfaces makes certain assumptions that the sociomaterial view contests. Existing literature suggests a separation between the user and the technology, which, in turn, results in designs that do not comply with a digitalized world that researchers have described as multiple, dynamic, entangled, and relational (Barad, 2007; Mazmanian, Cohn, & Dourish, 2014; Scott & Orlikowski, 2014). Furthermore, today, experiences, the experience economy, and customer experience management take center stage, and we can see digital technologies’ becoming increasingly experiential (Yoo, 2010), ubiquitous, and embedded (Dourish, 2001). For example, the SixthSense¹ (Mistry, 2010) solution facilitates action and manipulates, retrieves, or exchanges information about this action. It can present information on any surface and is a “wearable gestural interface that augments the physical world around us with digital information” (Mistry 2010). Further, with SixthSense, one can take pictures just by “framing” the fingers and arrange and look at them on any surface. With the concept of user interface, traditionally considered as a layer between the technology and the user (Marcus, 2002; Nielsen & Hackos, 1993; Shneiderman & Plaisant, 2005), it becomes difficult to identify what, where, and when the user interface is in the SixthSense entanglement. The interface is everywhere, nowhere, momentarily and all the time depending on action (see Figure 1). With this in mind, it becomes relevant to question the term *interface* and consider a new take on user interface design in order to develop design practices for digitalized experiences.

The increased digitization of physical products, such as phones, cars (Hylving, 2015; Hylving, Henfridsson, & Selander, 2012), newspapers (Ihlström & Henfridsson, 2005), and cameras (Tripsas, 2009), challenges the fundamental logics of artifacts (Riemer & Johnston, 2014; Svahn & Henfridsson, 2012) and the Cartesian ontological perspective of separateness (Barad, 2007; Orlikowski, 2009). Digitalization also changes how and when artifacts are used (Dourish, 2001; Mistry, Maes, & Chang, 2009) and introduces experiential opportunities and new possibilities for interpretation. Digitalization even expands the boundaries of self-identity outside of the physical body to include avatars (Schultze, 2012). Yet, Scott and Orlikowski (2014) note that:

Given the current evidence of unprecedented shifts associated with technologies in practice—cloud computing, automated trading, data mining, mobile platforms, robotic assistance, and social media, to name just a few—it may be more germane to develop ways of thinking and working that allow us to investigate a reality that is dynamic, multiple, and entangled. (p. 873)

With this need for new ways of thinking about digitalization, scholars have introduced many interesting and valuable insights, such as how difficult it is to articulate the shifts and asymmetries between people, social structures, digitized artifacts, and other objects (Mazmanian et al., 2014) and how anonymity (Scott & Orlikowski, 2014) or self-identity (Schultze, 2012) is enacted. Digitalization opens up for questioning whether artifacts have physical and functional properties (Riemer & Johnston, 2014), such as an interface (Shneiderman & Plaisant, 2005) and usability (Nielsen & Hackos, 1993), and whether one can implement

¹ SixthSense is a gesture-based wearable developed by MIT media lab. The configuration includes cameras, projectors, eyes, gesture recognition technology, fingers, search capabilities, and more that one can use to collect, project, and manipulate data. The configuration enables different experiences depending on what action one performs. For a more detailed description of SixthSense, visit <http://www.pranavmistry.com/projects/sixthsense/>

an algorithm into them for context awareness (Schiaffino, Armentano, & Amandi, 2010). In short, as digitalization intensifies, artifacts become more ubiquitous (Dourish, 2001) and volatile. To address the challenges associated with ubiquitous and volatile digitalized experiences, I suggest and define three useful concepts for the HCI discipline based on agential realism and sociomateriality.

Figure 1. SixthSense Interface

Agential realism adopts a relational and performative ontology. A relational ontology becomes more visible, understandable, and relevant in the digitalized era where the meaning of relations are more fundamental than separated elements (Scott & Orlikowski, 2014). I draw on agential realism to encourage a sociomaterial take on design and to move away from interfaces and toward experiences. In established practice, interaction designers focus on designing interfaces to improve artifacts and, thereby, the experience users have with the artifact. This single-minded focus on interfaces presents challenges in the transition toward the digitalized experiential world that embraces relationality, multiplicity, and dynamism (Scott & Orlikowski, 2014).

Yoo's (2010) work highlights the need to focus design practices in use to understand how to innovate for possible digitalized future experiences. Accordingly, they call for more research in the area. Additionally, in line with an increased focus on sociomaterial research (Cecez-Kecmanovic, Galliers, Henfridsson, Newell, & Vidgen, 2010; Kautz & Jensen, 2013; Orlikowski, 2007), we need more researchers and practitioners to apply the sociomaterial perspective in design (Leonardi & Rodriguez-Lluesma, 2012). Designers should create a practice that enables possibilities for experiences rather than trying to predefine and control a design so it fits a plan (Germonprez, Hovorka, & Collopy, 2007; Germonprez, Hovorka, & Gal, 2011; Orlikowski & Hofman, 1997). Following Yoo's (2010) call for more focus on experiential design, I define useful concepts to broaden current design paths when designing for potential experiences. In addition, I present a set of design guidelines to facilitate the process of designing for experiences.

2 Sociomateriality

Yoo (2010) points out that the nature of what is being designed has changed from purely material artifacts to sociomaterial experiences. However, the well-established Cartesian perspective of separation between

the social and material is still the guiding paradigm with its concepts and vocabulary (Kaptelinin & Bannon 2012) (e.g., the concept of interface usability as described by Bevan (2001) and Nielsen and Hackos (1993)). These concepts and associated vocabulary tend to direct designers' attention towards either material or social elements rather than toward realities that comprise sociomaterial entanglements and continuous reconfigurings.

The sociomaterial perspective embraces the view that material and social elements are inseparable, equally included and dependent in the experience, and should be considered as one in the experience (Barad, 2007; Schultze, 2012). Sociomateriality also draws on how the social and the material are entangled and obtain meaning and relevance in action (Barad, 2007), and it is based on a relational and performative ontology rather than a determinant ontology with independent objects with properties (Scott & Orlikowski, 2014). Thus, experiences emerge from active sociomaterial entanglements where the matter and the meaning are not two separate entities but rather co-constituted. Consequently, in the practice of designing for potential experiences, a sociomaterial ontological perspective is advantageous because it is inclusive and holistic. For example, SixthSense allows multiple experiences depending on what the sociomaterial entanglement enacts, such as remembering information, highlighting details, or creating memories. The sociomaterial experience is performative (Pickering, 1995) and creates meaning in the enactment (Barad, 2007).

To put sociomateriality to work in practice, I introduce three concepts, namely *quasi-objects*, agential cuts and intra actions, which are essential in designing for potential experiences.

2.1 Quasi-objects as Meaning Creators

To describe something that emerges in action (i.e., how the material and the social are co-constitutive, which creates the collective and its meaning), the French philosopher Serres (1980) use the term "quasi-objects". Serres explains quasi-objects by referring to the meaning of a ball in action; when the ball is in use, the meaning is created. That is, he means that quasi-objects are bundling and enabling entanglements, which creates meanings (Serres, 1980). Since a quasi-object is a transparent means whereby meanings emerge, it is neither a subject nor object (even though the concept includes the word "object"); it is neither material nor social. It emerges and disappears and it can be considered as multiple and single simultaneously. Thus, it is impossible to say where it starts and where it ends.

Bateson (1972) discusses a useful story about a blind man for explaining what a quasi-object is. He asks:

Where does the blind man's self begin? At the tip of the stick? At the handle of the stick? Or at some halfway up the stick? These questions are nonsense, because the stick is a pathway along which differences are transmitted under transformation, so that to draw a delimiting line across this pathway is to cut off a part of the systemic circuit which determines the blind man's locomotion. (p. 318)

The Blind man story exemplifies the emergence of quasi-objects and further emphasizes the necessity to look at action and experiences as sociomaterial entanglements or, as Bateson calls it, a "systemic circuit" (Bateson 1972) and not separate entities as a Cartesian worldview would have one believe.

Thus, one can consider a quasi-object as creating meaning with a set of entangled configurations in "dynamic reconfigurations" (Mazmanian et al., 2014). The blind man and the stick are sociomaterial dynamic reconfigurations where quasi-objects, meanings, emerge depending on what is being done. Quasi-objects form the experience and take it forward to the next experience. One can also explain this "taking it forward" as agency. Quasi-objects are entangled agency produced by sociomaterial configurations that affect the outcome of the action (Introna, 2014; Mazmanian et al., 2014; Orlikowski, 2009; Suchman, 2006). As such, quasi-objects are multiple yet single, neither social nor material, temporary yet constant, and they have implications of how an experience evolves, what meaning it has, and what direction it takes.

Recognizing quasi-objects' emergence and evolvment during experience can help one to direct the experience and include wanted or exclude unwanted meaning in the action. Thus, I use quasi-objects in this paper to advance how meanings emerge in action and experiences. The word focuses one's attention on an experience's meaning. For example, quasi-objects that emerge in the sociomaterial entanglement of SixthSense (Mistry, 2010) facilitate certain experiences and set the stage for future experiences; these experiences depend on what happens, where and what actions are completed, and how the entanglement is constituted.

However, using quasi-objects in relation to the concepts of user interface and interface design makes little or no sense since the sociomaterial entanglements and the meaning they produce (i.e., the quasi-objects)—not whether a social or material element needs to be “connected” with an interface—matter. Therefore, abandoning the Cartesian perspective and the well-established interface terminology and embracing the concept of quasi-objects in order to move forward in design practices helps one establish a terminological and analytical foundation for developing potential experiences. Potential experiences can be boring, fun, informative, long lasting, short, or whatever feeling, emotion, or sensation the designer wishes.

2.2 Agential Cuts as an Analytical Tool

In order to understand how sociomaterial entanglements are constituted and to improve the capabilities of analyzing and understanding sociomaterial quasi-objects and the meanings and experiences that emerge, one can use an agential cut. These cuts enable one to separate entanglements and identify different elements included in the entanglement in a specific moment (Barad, 2007). One can consider agential cuts as an analytical tool to recognize specific influencers, and one can consider those aspects as constitutive exclusions (Barad, 2003). Scott and Orlikowski (2014) point out that “it is important not only to analyze what is included in practice but also what is excluded” (p. 887) in order to understand the entanglement. With knowledge of the entanglement’s constitution, one can manipulate it to impact an experience. Being aware of what to include or exclude for a potential experience helps one make decision decision, which, in turn, helps one to come closer to a set goal, need, or requirement. For example, the SixthSense entanglement allows one to use any surface in the experience, such as a hand, a wall, or a newspaper (see Figure 2). Choosing design options that allow the SixthSense entanglement to include any surfaces for information presentation allows for certain experiences and limits others. For example, if one made agential cuts under water or in space, other potential experiences would emerge, or be limited to emerge, with the SixthSense entanglement.

Figure 2. SixthSense Arm Buttons

By envisaging agential cuts, designers can consciously reflect on a configuration's constitution and what it includes and, more importantly, recognize what they should import into the entanglement to influence an experience. For example, if one considered the weather when designing for a potential experience, one could offer umbrellas or cups of water depending on where, how, when, and what action took place. An agential cut would help the designer to understand the constitution of the entanglement and invite the designer to reflect on how to include, or exclude, potential influencers of an experience.

Depending on when one makes this agential cut, the separation of the entanglement will be different. With the example of the blind man with the stick, if one made the agential cut at the hand where it held the stick or at the end of the stick where it touched the ground or somewhere along the stick, there would most likely be very different outcomes if a designer actively decided to make an agential cut at one of these three different places. Consequently, to increase the possibilities to actually design for a potential experience, agential cuts need to be frequently envisaged when designing for experiences since entanglements continuously create quasi-objects in their dynamic reconfigurations.

One can say that designers already envisage agential cuts in traditional user interface design. The preconception that the material/technology and the user are separate or "cut apart" that can be connected or "uncut" with an interface is a Cartesian ontological perspective. This ontological approach limits designers from innovating for potential experiences in that it constrains them to look at either the technology/material or social aspects in isolation rather than doing so in an open-minded, inclusive, and holistic manner.

In sum, agential cuts are practical, and one can use them as an analytical tool to better understand the constitution of an entanglement and what quasi-objects emerge in a specific moment in time. They can assist in innovation processes where designers need to explore and understand the complexity of experiences, and they can help designers diverge from set design practices that involve focusing only on the technology/material.

2.3 Intra-actions and Relations Within

Further, when one creates separateness for analytical reasons with the help of an agential cut and one better understands and recognizes the entanglement, it is valuable to understand emerging relations in the entanglement. Some aspects of the entanglement might be more influential than others at a specific moment and can, therefore, influence or enable a certain experience. For example, the finger action and the projection mechanism in SixthSense creates a strong relation when projecting a picture but less when taking the picture. Identifying and understanding a relation can also improve the understanding of *why* a meaning emerges. To further understand this relation, the concept of intra-actions is useful.

Barad (2007) coined intra-action to emphasize emerged actions in sociomaterial entanglements. One can contrast intra-action with interaction, which emphasizes actions between the different separated elements, such as between a computer and a human, and considers interfaces as a means for interaction. However, a sociomaterial perspective emphasizes the relationship in the entanglement, where the ability to act emerges.

To understand which intra-actions come forth in an entanglement, one needs to observe the action and the emerged quasi-objects that action produces simultaneously and at a specific moment. Using the agential cut to exploit an entanglement in action in order to identify which configurations are involved in a specific moment introduces possibilities to include or limit potential influencers. Focusing on how an action is accomplished and how intra-actions come forth in an entanglement can help when designing for potential experiences by allowing or limiting when new configurations emerge. The concept of intra-actions can also help one understand why a certain quasi-object emerges. If one can identify intra-actions that are stronger than others in the entanglement in a specific moment, one can more easily identify where and how the quasi-object emerges. Again, if we consider different fingers' intra-actions in the sociomaterial entanglement of SixthSense, they create different relations depending on what is being done. That is, configurations in the enactment enable different intra-actions that depend on what quasi-objects emerge and vice versa. Consequently, intra-actions and quasi-objects are also dependent and relational, co-constitute each other, and form underlying possibilities for each other.

However, in interface design, the approach is mutually exclusive since the focus is on technology and because the mindset is that an action either belongs to the technology or the user. However, with intra-

actions, an action emerges, or co-articulates, in the entanglement (Iledema, 2007). Understanding how, when, and where different sociomaterial configurations are entangled and related and how, when, and where they depend on and restrict each other in an action is crucial to be able to improve an experience in terms of what it should include or exclude to bring the action forward in the desired direction.

Just like sociomaterial configurations come and go during an enactment, the intra-actions emerge and disappear in the entanglement and are in constant reconfiguration (Mazmanian et al., 2014; Suchman, 2006). For example, the SixthSense case shows how different configurations change throughout the enactment. Different configurations are more or less involved while taking a picture by “framing” fingers compared to arranging the pictures afterwards on a surface. When taking a picture, the fingers have one purpose and effect; while when arranging the pictures, they have another purpose and effect. In other words, different intra-actions come forth and result in diverse quasi-objects. That is, the particular intra-actions and quasi-objects that emerge influence an experience differently. Furthermore, the more configurations a sociomaterial experience includes, the more complex it is to identify and understand the influence of different intra-actions and quasi-objects in the entanglement. For example, if we compare the blind man and his stick with a car ride, the temporality of the movement/action of the two different sociomaterial configurations influences what intra-actions that come forth (i.e., the emerging quasi-objects), how fast designers should envisage agential cuts, and even how many agential cuts they should envisage. Indeed, using the SixthSense system on a space shuttle or in a small dark room with limited moving space would require other considerations for the designer in order to enable new, more exciting or boring experiences.

I finish this section with Forrester and Reason’s (1990) suggestion to focus on key elements (i.e., recognized with the help of an agential cut) identifiable within a dynamic interconnected context (aka the sociomaterial entanglement) so as to move beyond interface design and not only execute “little cumulative progress” (p. 279) when designing for the digitalized experiential era. However, I would add that one can recognize “key elements” with the help of agential cuts and that sociomaterial entanglements and reconfigurings are the “dynamic interconnected context”. Therefore, I draw on Barad’s (2007) agential realism in order to move towards experiential design and articulate the need to focus on emerging sociomaterial quasi-objects that are distinguishable temporally with the help of an agential cut in dynamic reconfigurations, which enables intra-actions.

3 Methodological Approach Conveyed

I wrote this paper due to my involvement over several years in research projects that focus on designing and developing user interfaces. These projects have centered on the automotive industry where the increasing use of digital material (e.g., software) in products and processes has affected the way firms design cars (Broy, 2006). In the last 20 years, ergonomic engineers who work solely with physical material have changed to interaction designers and user interface designers who focus on digitalization practices. For example, one company I studied established a digital user experience (DUX) group as a strategy in order to meet the digitalized experiential era that focuses more on the customer experience and less on the product as a physical artifact for transportation. This company also established relations with non-traditional stakeholders in the food industry and with toy factories and furniture companies in order to broaden the digitalized innovation horizon so that car users could experience new things when using cars in new contexts. For example, a solution they developed made it possible to go to a furniture store and see how many packages of furniture they could transport in the car. However, when DUX engineers entered the stage, many discussions that focused on what a user interface is emerged. In addition, institutionalized processes such as terminology and innovation practices hampered new employees who had digitalized practices, skills, and expertise when they tried to design for experiences. Although [DUX engineers aimed to design for experiences, discussions about how to improve the technology and interfaces rather than actually improving possibilities for sociomaterial experiences undermined it. Consequently, as the example of this car design company shows, answering that question of “what is an interface” was not enough to improve the understanding and further advance the development of experiences and experiential design. In order to move forward, one needs to also ask what, when, and where the user interface is.

In order to answer these questions, I conducted a focused literature review (Webster & Watson, 2002) by following a hermeneutical approach (Boell & Cecez-Kecmanovic, 2014) and focusing on user interface design. I performed the literature review in three phases. In the first phase, I conducted a structured search (Webster & Watson, 2002) to better understand the concept of user interfaces. In the second

phase, I read references mentioned in papers from the first phase that seemed to be relevant to better understand what, when, and where a user interface is. In the third phase, I focused on different concepts that the HCI literature discusses: the Cartesian view (which separates humans and technology) and sociomateriality (which considers the social and material as one). More specifically, the literature review exposed limitations with the traditional user interface design concepts of usability and context.

To understand the nuances and implications of the two different ontological perspectives of interface design that came up during the literature review (Boell & Cecez-Kecmanovic, 2014; Webster & Watson, 2002), I draw on the agential realism perspective of sociomateriality (Barad, 2007; Orlikowski, 2009, 2007, 2010; Scott & Orlikowski, 2014). In doing so, I could explain the two ontological perspectives related to the HCI domain and compare the traditional way of talking about interfaces with the sociomaterial quasi-objects that I introduce in this paper.

4 Comparison of Interface and Sociomaterial Quasi-Objects

Although Forrester and Reason (1990) clearly separate between the user, the interest the user has, the tools employed, and “the ‘ensemble’ of representations brought to bear” (Forrester & Reason, 1990, p. 279), they have a somewhat relational and performative ontology even though the authors do not explicitly state as much. They write:

In the everyday world of system design, procedures are devised largely on an ad hoc basis, and the argument here is that unless a more considered theoretical framework is developed—to include user, system, task domain and the learning process itself—little cumulative progress will be made. We must identify more clearly what exactly is involved when a person uses (and learns from) a computer if we are to realize the considerable potential of more recent technological developments. (p. 279)

This paper is a first attempt to develop such a theoretical framework they mention.

Forrester and Reason (1990) discuss many sociomaterial perspectives along with the motivations for why they are important. For example, they write about what material and social elements are involved when a person uses (in action) a computer and the importance of focusing on the process (the doing) as “a dynamic relationship between the user, an interest, (e.g. problem specification, task solution, browsing activity), and an ensemble of representations (via screen, notepad, user’s memory, and so on) and tools (e.g., software manipulation, pencil, user tactics and techniques)” (p. 279). In other words, they highlight sociomaterial configurations that are constantly changing and being reconfigured (Mazmanian et al., 2014). One can see as much in SixthSense configuration where the sociomaterial enactment is the experience, such as being informed). It is not the surface where the information is projected, the person included in the entanglement alone, nor the technology projecting information in the SixthSense solution that makes the experience. Rather, that surface where the information is presented, traditionally called the interface, is only one of many influencers in the entanglement that matters for the experience. The same goes for the person and the technology included in the entanglement. In contrast, the traditional perspective on interfaces emphasizes the surface of the technology. The traditional Cartesian view of interfaces is as an attribute of the technology; in other words, the technology has an interface that enables users to interact with it (Shneiderman, 1987).

Cartesian arguments are based on separateness between the technology and the user, which means that the liability is *either* on the technology *or* the user if something fails or succeeds. For one, with a Cartesian perspective, one can measure user interfaces’ effectiveness, efficiency, and ease of use (Nielsen & Hackos, 1993). Researchers have described interfaces as structures for communication between a user and the computer (Daintith, 2009). Consequently, with this traditional take on user interface design where one uses standards and guidelines to achieve “good” and “usable” interfaces, the practice of designing follows accordingly (Kaptelinin & Bannon, 2012) in that it focuses solely on the technology/material and its properties (Norman, 2013). Therefore, to move from interfaces to experiences in design practices, we need a new vocabulary that reflects this shift from traditional interface notions of context and usability to a sociomaterial take on design in the digital era. The text below scrutinizes traditional interface notions including context and usability using a sociomaterial perspective.

4.1 Context in Interfaces vs. Sociomaterial Quasi-objects

Alarcón, Guerrero, Ochoa, and Pino (2006) follow the established Cartesian view and argue that the user will benefit if technology embeds knowledge and information of when one will use it and how the surrounding environment works. Further, Reeves et al. (2004) argue that such a context-aware system used in a complex situation can assist users. For example, if a user is in a complex situation, a digitized system can choose to enable or disable whether it presents certain information. Others argue that other context-aware user interfaces help users to reduce cognitive load and deal with complexity, which minimizes their need for help and helps them more easily use system (Edmonds & Dautenhahn, 1999; Trumbly, Arnett, & Johnson, 1994).

An interface agent can recognize user contexts such as preferences, habits, knowledge, and behavioral patterns regarding a particular domain for a specific user and, thereafter, use them. According to Schiaffino et al. (2010), this is possible by including a degree of certainty in a mathematical model and implementing it into the system. These kinds of techniques are used to filter data that can benefit the user (e.g., by reducing their cognitive load) (Ablaßmeier, Poitschke, Reifinger, & Rigoll, 2007).

However, research has noted it is difficult to understand when contextual factors are important in the design process (Lavie & Meyer, 2010). If one considers context as a form of information about preferences, habits, knowledge, and so on that is delineable and stable and as separating the user and the technology (Dourish, 2004), then one limits the innovation space. Designers will focus only on the technology to solve an issue instead of considering sociomaterial entanglements as complex configurations that they need to understand. Indeed, context does not concern only information but belongs to a complex relational ontology of sociomaterial enactments. Furthermore, context is not delineable where one can define and foresee what counts as a context; it is dynamic and features constant re-configurations (Mazmanian et al., 2014; Suchman, 1987, 2007). A context is never stable; as such, one cannot easily determine what contextual information to include from time to time. Thus, one can consider context as an occasioned property that is relevant to particular settings and actions (Dourish, 2004).

From a sociomaterial perspective, context is “actively produced, maintained and enacted in the course of the activity at hand” (Dourish, 2004, p. 22) and, therefore, only identifiable in the moment of the experience. For example, the meanings and experience of SixthSense are co-produced when emerging and co-constituting the context, which cannot be foreseen due to the constant reconfigurations of the world (Suchman, 2006). A wall can have an active or passive role in a momentary configuration and co-create new meaning in the next moment depending on what is being done. Because every second differs, designing for an improved, intensified, or maybe boring experience requires one to consider constant reconfigurations so that experiences can be tailorable, flexible, and dynamic in design (Germonprez et al., 2007). Configurations come and go and influence the contextual enactment differently along the way (Mazmanian et al., 2014), which one can understand when considering SixthSense, where the different configurations involved depend on what action is being accomplished (taking pictures, being informed about flight information, and so forth) and what context that emerges due to that. Even if it is impossible to include all possible configurations in a design, the sociomaterial perspective of context facilitates a more dynamic, inclusive, and open-minded design approach where quasi-objects and intra-actions emerge and disappear continuously.

4.2 Usability in User Interfaces vs. Sociomaterial Quasi-objects

The usability concept is rather mature; researchers have defined it from a Cartesian perspective as a property that assesses how easy a user interface is to use (Goodwin, 1987; Hartson, Andre, & Williges, 2001; Lavery, Cockton, & Atkinson, 1997). Improving usability is frequently considered as optimizing efficiency, effectiveness and satisfaction for the user by means of user interface solutions (ISO, 2015). The usability concept includes different aspects, such as acceptance, use, and adoption (Bevan, 1991; Tractinsky, 1997); learnability and relevance (Lecroff & Paternó, 1998); and engagement and emotions (Hartmann et al., 2008) such as enjoyment, connectedness, and cohesion (Lim, Cha, Park, Lee, & Kim, 2011).

Although researchers have examined the relationship between usability and context by expressing usability as depending on the context of use (Kong, Zhang, Yu, & Xia, 2011), they have also recognized the difficulties of testing and evaluating usability in the correct context (Ovaska, 1991). To overcome these difficulties, they have developed tools and measuring techniques to enable usability evaluation and testing

in the “correct” context (Bevan & Macleod, 1994). The context of use—expressed as user goals and needs, tasks to be accomplished, and environmental characteristics as expressed in traditional HCI literature—have been different aspects taken into account when testing usability.

Other research shows how the aesthetics of an artefact also have effects on usability measures to the point where one may consider user interfaces highly usable just because users see them as beautiful (Tractinsky, 1997; Tractinsky, Katz, & Ikar, 2000). For example, Hartmann, Sutcliffe, and De Angeli (2008) show that, even though an aesthetic user interface has less favorable usability features compared to a less aesthetic user interface with high usability features, the majority choose the aesthetic one with less usability for future interaction. But, discussions about “characteristics” of user interfaces, such as aesthetic, are irrelevant since it is impossible to consider a user interface as the only “carrier” of usability. Tractinsky et al. (2000) point out this paradox by stating that the relation between aesthetics and usability is complex because it is not only “what is beautiful is usable” as the title of their paper states.

Riemer and Vehring (2010) take the usability concept even further by explicitly underscoring that usability is not a property of technology (i.e., the user interface). Rather, usability manifests only in practice in the sociomaterial experience, and one should not conceptualize it as something in its own right. For this reason, we need to understand sociomaterial entanglement, which can include use context, social ideas, norms, practices, and technical aspects, when talking about usability (Riemer & Vehring, 2010). If we think of usability as an experience of entanglements, then usability can exist and not exist at the same time depending on the current sociomaterial configuration and its specific intra-actions and emerged quasi-objects at the specific moment in question. Molich, Ede, Kaasgaard, and Karyukin (2004) illustrate this dynamic relational process: seven labs identified 310 usability problems in total, but only one single problem was identified by all seven labs. This study also showed that one lab identified 75 percent of the problems.

Consequently, people engaged in tests, laboratories, and methods that focus on usability should have in mind that usability emerges in practice because it is situational and dependent on how quasi-objects occur and intra-actions come forth within the entanglement. Heraclitus’ famous quote that “a man cannot step in the same river twice” illustrates this dynamism in the meaning that nothing is constant and everything is constantly being reconfigured. Therefore, the validity and effectiveness of measuring usability or consider it as a property of technology (Riemer & Vehring, 2010) can be questioned because quasi-objects continuously emerge and a sociomaterial configuration is never the same twice.

5 Discussion

Although little research has examined sociomateriality in relation to experiences and user interfaces, some researchers have called for more research of how sociomaterial entanglements are tailored in action (Germonprez et al, 2011). Indeed, in this current era of digitalized experiences with the increased presence and importance of digital infrastructures and digitized artifacts, it is appropriate to explore sociomaterial quasi-objects, intra-actions, and agential cuts further. I believe the technological development and digitalization have effects on what we do, how we do it, why we do it, if we do it, when we do it, and who we are.

However, even if the increase of digitalization encourages scholars to “stretch the boundaries of their intellectual imagination” (Yoo, 2013, p. 232) by using a sociomaterial perspective, they need to do more to make sociomateriality really matter: they need to find ways to apply it in practice. For this reason, a set of concepts is a good start in learning to use a sociomaterial perspective in practice. The concepts, which I propose in this paper, represent a first attempt to support the practice of sociomaterial design for potential experiences and expand the design vocabulary. By identifying and applying the concepts of agential cuts and intra-actions (Barad, 2007) and the metaphysical concept quasi-objects (Serres, 1980), I explain how a sociomaterial experience emerges and what it is. Thus, this paper contributes to our awareness of the complexity of experiences and the sociomaterial entanglements they constitute—how, what, and where configurations are or whether one can include/exclude them in an experience. Developing this awareness also reveals how the Cartesian design approach with “usable interfaces” and “defined contexts” is insufficient for experiential design instead of simply designing artifacts with interfaces. But to make sociomateriality truly practicable, I present a set of guidelines below. Others can use these guidelines in designing experiences to understand how configurations emerge, their constitutions, and how they are entangled.

1. When starting to design for an experience, one should look at the action (i.e., the performance or “the doing”) as a whole rather than as separate social and material entities that interact in a certain way. Having a sociomaterial approach when designing allow designers to better understand what configurations are included, or what should be included, excluded or limited in potential experiences.
2. The quasi-object is a useful concept when discussing what meanings and experiences the designer wants to achieve or make possible. Crucially, for the HCI community, quasi-objects open up discussions about how experiences can vary in relation to specific configurations that people enact in contexts of use. Therefore, it allows people, such as stakeholders in a design process, to even begin to discuss the meaning of the experience and how people (users) create meaning.
3. By envisaging an agential cut, stakeholders in the design process can identify and value the different configurations (e.g., asking questions such as “What is important in this type of experience that we are trying to create?” and “Can we improve the experience by consciously adding new configurations into, or removing others from, the entanglement?”). Using an agential cut is an efficient and conscious way to recognize a configuration’s constitution and what an experience does or should include. The agential cut is an analytical tool for designing for experiences; a designer envisages conscious agential cuts to understand an experience and acknowledge the complexity of sociomaterial entanglements. For example, when designing for experiences, the designer might realize that weather conditions are relevant and try to include weather information to make the experience more magical and beautiful.
4. When one has identified different configurations, one next has to understand emerging actions (or relations) in the entanglement, the intra-actions, how the different configurations influence each other, and which relations are strong and which are weak. In this stage, the designer can try to manipulate the intra-actions to see what effects a change has. For example, if the designer includes something new such as weather information, new intra-actions (and quasi-objects) will emerge in the entanglement and another experience is possible. With the SixthSense case, one can see the many different intra-actions that emerge between different configurations depending on what action one performs and also how certain configurations result in similar outcomes. Yet, one should remember that configurations can have different purposes and meanings. For example, the tip of a finger can draw a line, select an area, enter a number, point, and so forth. In other words, the intra-actions that emerge with the fingertip differ for each moment/purpose/action.

Hence, since all experiences are sociomaterial, a separation of the social and material is limiting. By comparing two different concepts (namely, context and usability), I show how a sociomaterial perspective opens up possibilities for innovation in experiential design. Even though attention to interfaces are still valid in some instances, interfaces do not “make” the experience. And the question is, *if* they exist, what, when, and where are they? In this paper, I answer that question, though I realize that researchers need to further explore these questions. In my own search for an answer, I realized the advantages of a sociomaterial perspective and introduce a new design approach. Quasi-objects, agential cuts, and intra-actions open up for a broader innovation span by not limiting designers to only focus on the technology as the foundation for experiences.

This paper points out that traditional user interface concepts, such as usability and context, can have other meanings depending on ontological perspective. Depending on what ontological view designers have in a developing process, the outcome can differ.

This paper’s contribution is twofold. First, in a digitalized world where experiential computing is becoming increasingly in focus, I introduce the concepts of sociomaterial quasi-objects, intra-actions, and agential cuts to change mindsets and to talk in new ways about and design for potential experiences. I introduce these concepts to make it possible to diverge from the set of institutionalized Cartesian-based words and concepts that hamper new innovative designs. Second, I introduce guidelines for practitioners to consider when designing for potential experiences in the digital era. The guidelines build on the concepts I introduce and invite a holistic and inclusive design approach where meanings and relations take the center stage instead of separated into distinct yet interacting material and social entities.

In addition, by presenting limitations of established vocabulary for designing user interfaces in the era of digitalized experiences, I highlight the advantages of a sociomaterial perspective. In the end, the concepts

introduced in this paper sensitize us to concepts (Bowen, 2008) that can be used to improve the practice of designing for experiences.

Table 1. Overview of the Two Ontological Perspectives

Two design approaches	View on experiences	Context	Usability
The traditional Cartesian approach	Experiences happen when people and their surroundings are connected via an interface. An interface is “a layer between the technology and the user” or “a connecting medium between artifact and user” and is “a property of the technology”.	A form of information that is delineable and stable and where one separates not only the user and the technology but also often activity and context (Dourish, 2004).	A property (of the interface) that assesses how easy a user interface is to use (Bevan, 2001).
The sociomaterial approach	Experiences are quasi-objects that one can distinguish temporally with the help of an agential cut in dynamic reconfigurations, which enables intra-actions	It is temporary and continuously changing and arises from the activity (Dourish, 2004).	Can only be understood in each of the particular use contexts, which, in turn, emerge from the enactment of the entanglement (Riemer & Vehring, 2010).

6 Conclusion

This conceptual paper is a first step to manifest a sociomaterial take on experiential design. The guidelines include concepts that allow designers to think and talk in new ways about sociomaterial experiences and design for them. The concepts are relevant and useful because experiences are becoming center stage along with experiential computing (Redström, 2008); thus, we need a change in vocabulary and mindset. Furthermore, adjusting our ontological perspective away from Cartesian and towards a relational and sociomaterial take on design is necessary in times of digitalization and has proven fruitful when understanding the increasingly digitalized world. This paper takes design one step further (i.e., from understanding to practice) to make sociomateriality not only an ontological perspective but practical and applicable.

The sociomaterial take on design practices connected to digitalized experiences also results in implications for future research. Barad (2007) points out that “practice of knowing [understanding] and being are not isolable; they are mutually implicated. We don’t obtain knowledge by standing outside of the world; we know because we are of the world” (p. 185). Thus, design scholars would benefit by being in the design process to fully explore the implications of this perspective. In fact, it is not only a sociomaterial ontology that is required in order to practice the guidelines; it is rather an “onto-epistem-ological” (Barad, 2007) approach. That is, understanding the phenomena by being a part of it.

Although Serres (1980) defines and describes quasi-objects and although I use the concept in this paper, little research in the HCI field has explored and discussed the concept. Although research has used agential cuts (e.g., in Schultze’s (2012) work on self-identity and avatars), researchers have not applied or used them as an analytical tool in design practices. The concept of intra-actions deserves further articulation in order to deepen our understanding of sociomaterial configurations and the quasi-objects and intra-actions that emerge in entanglements.

To this end, the paper is a conceptual contribution that introduces the concepts and guidelines that we need to further explore and understand both empirically and from an onto-epistem-ological perspective.

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