On the Surface of Things: Experiential Properties of the Use of Craft Materials on Interactive Artefacts

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Abstract

Surface materials play a central role in the way we experience things. This is also the case with interactive artefacts, since the materials that are used for designing a surface or a casing will affect the ways in which the artefact will be physically interacted with and experienced as an object. In this paper we take a closer look at physical surfaces and study the experiential properties of different types of craft materials, which in our case are leather, textile, metal and wood. We look at how they influence the experience of interacting with an artefact by providing illustrative examples of interactive artefacts from our own design research, in which such materials have been used on their surface.

In order to do this we distinguish between three types of experiential properties based on Giaccardi and Karana's materials experience framework (Giaccardi & Karana, 2015), and on Fernaeus et al. action-centric tangible interaction (Fernaeus, Tholander, & Jonsson, 2008). These are sensory experience, physical manipulation, and interactive behaviour. The purpose with our distinction between the three experiential properties is to illustrate possible ways in which a craft material can influence the interaction with an artefact, focusing on the sensorial experience craft materials offer, how they afford particular physical manipulations in regards to the ways they can be given shape, and finally how they can offer interactive qualities based on their abilities to conduct, to resist, or trigger. We end by reflecting on the three experiential properties and discussing emerging topics that should be further considered when craft materials are used on the surface of interactive artefacts, in regards to craft values but also the social and cultural situatedness of surfaces and consequently artefacts.

Keywords

Craft materials; Interactive artefacts; Experiential properties; Leather; Metal; Textile; Wood; Surface;

Since computers can take very diverse physical forms or be embedded in any thing it becomes increasingly relevant to discuss how the physical appearance and the *surface* of interactive artefacts, can play a significant role in regards to the experience of interacting with tangible interactive artefacts (Janlert & Stolterman, 2015). Surface appearance has always been of fundamental importance in product design (Karana, 2009), whereas in interaction design studies have more recently highlighted this topic from a perspective of surface materials (Giaccardi, Karana, Robbins, & D'Olivo, 2014; Jonsson et al., 2016; Robbins, Giaccardi, & Karana, 2016). In this paper we are building on those studies in regards to surface materials, but we are focusing on a particular type of surface materials that we refer to as *craft materials,* here exemplified by leather, textile, silver and wood. We are referring to these materials as craft materials, because they are linked to a long crafting tradition that has evolved over centuries, including specialized tools and hands-on techniques for transforming each of those materials into utility objects. We find the combination of such craft materials with interactive technology to be particularly evocative for the domain of interaction design mainly due to the contradictory values between traditional crafts and computational technology, which are highlighted through hybrid crafting practices, aiming to combine these practices and materials (Golsteijn, van den Hoven, Frohlich, & Sellen, 2014; Gross, Bardzell, & Bardzell, 2013).

In this paper, instead of focusing on the concrete challenges of hybrid crafting, as discussed previously by e.g. (Perner-Wilson, Buechley, & Satomi, 2011; Rosner, Ikemiya, & Regan, 2015a; Tsaknaki, Fernaeus, & Schaub, 2014), we are looking at the experiential properties those craft materials can offer, when used as surface materials of interactive tangible artefacts. Specifically, we are presenting a series of illustrative examples from our own design research, in which leather, textile, metal or wood were used as surface materials of interactive artefacts, and we are providing an analysis of how each material with its unique properties may influence the interaction experience.

Our understanding of the notion of experiential properties is loosely based on the *materials experience* framework proposed by Giaccardi and Karana (Giaccardi & Karana, 2015) as well as on the *action-centric* perspective on tangible interaction, elaborated by Fernaeus et al. (Fernaeus et al., 2008). These works both point to how experience is shaped by a combination of sensory engagements with materials and actions that are contextually and socially situated in practice. With experiential properties we thus here refer both to material properties such as texture, being features of a physical surface that can be felt and experienced by our senses. But we are also referring to properties of a tangible interactive artefact that affect how experience unfolds in interaction, in regards to, for example, its interactive behavior. In the forthcoming analysis we are distinguishing between three categories of experiential properties, which are: a) sensory experience, b) physical manipulation, and c) interactive behavior. We are using those categories of properties in order to highlight the use of craft materials on the surface of interactive artefacts.

The reason why we chose those three is because they provide an account of experiential properties in regards to materials, while at the same time stress the importance of interaction. Specifically, sensory experience is used to describe the very particular sensorial properties of craft materials, which are also grounded in culture, and especially the tactile sensation. Physical manipulation is used to illustrate how craft materials, which demand a craft and hands-on approach on making, can inspire new design directions and guide design decisions, while at the same time provide a hands-on and tangible interaction gestalt. We will present concrete examples of how those craft materials can influence the experiential properties of interaction, and elaborate on what particular interactive qualities those craft materials can offer based on their abilities, for example, to conduct electricity, or to provide resources for digitally mediated actions, as triggers or buttons. We will end with a broader discussion on the use of craft surface materials on interactive artefacts and reflect on emerging issues in the intersection of interaction design and crafts.

Background

Materials play a central role in design practices, where acts of shaping or combining matter are involved. One such practice is interaction design, which concerns the design of interfaces, while at the same time includes the design of physical controls and devices. When talking about materials in this context, the definition extends from physical matter to immaterial, including software or code, apart from hardware (Blanchette, 2011; Fuchsberger, Murer, & Tscheligi, 2013; Lindell, 2013; Wiberg, 2013). There has already been a substantial body of work in studying the various material instances that expand from the mere physical to the fully computational and their in-between stages. One related topic of discussion concerns the blended materiality of the physical and computational, which forms a new material, with its own unique properties. An example of earlier research on this topic includes Vallgårda and Redström's (2007) c*omputational composites* , which are physical materials with additional computational properties of sensing and actuating. Similar research studies on materiality in interaction design point to the fact that artefacts can take various forms, instead of being predominantly screen-based, and they are no longer restricted by the clear distinction between physical casings and electronic components or computation. Other studies on the many facets of materiality and the design of interactive or electronic products have pointed to the fact that materials are not only affecting a product in regards to style and form, but they are also shaping social practices around it. The materiality of interactive artefacts in relation to the experience those materials provide are "shaping ways of doing and ultimately, practice" according to Giaccardi and Karana (2015, p.2447).

Craft Materials in Interaction Design

The combination of physical and computational materials has been also studied from a crafts perspective, often described as hybrid crafting (Golsteijn et al., 2014), or hybrid fabrication (Zoran & Buechley, 2013). In the interaction design domain there has been an increased interest in crafts lately, mainly highlighting the intersection of so-called traditional crafting practices with contemporary practices of designing with interactive technology. A number of researchers looked at what design can learn from values embedded in crafting (Bardzell, Rosner, & Bardzell, 2012; Bofylatos, 2017; Jacobs et al., 2016), while others speculated on the use of specialized tools for programming computation composite materials, drawing inspiration from craft practices (Vallgårda, Boer, Tsaknaki, & Svanæs, 2016). What is more, the resurgence of crafts in interaction design brought with it a focus towards craft materials such as glass (Schmid, Rümelin, & Richter, 2013), textiles (Buechley & Perner-Wilson, 2012), or ceramics (Meese et al., 2013; Rosner, Ikemiya, & Regan, 2015b). Such materials are often referred to as *traditional* in order to stress their relation to culture, history or to distinguish those from *functional* ones, as described by Vallgårda in the following quote:

> Traditional materials are those we all have direct experience with, and which has been around, if not since the beginning of time, then at least for centuries (e.g. wood, clay, textile, metal). Functional materials, on the other hand, are the designed materials that flooded the market after chemistry, physics, and engineering joined together in studying and improving materials (e.g. plastic, fiberglass, electroluminescent film) in what was to be called materials science (Vallgårda, 2009, p.52).

Similarly, leather, textile, metal and wood discussed in this paper belong to the category of traditional materials, since each has an old crafting practice dedicated to the art of manipulating it. However, in this paper we will use the term craft materials, in order to stress their relation to crafting, as a way of giving form to them, involving a set of techniques and specialized tools. Those craft materials have been used traditionally and until nowadays for designing a range of utility products, such as leather bags, cutlery or jewellery, clothes or cushions, but they are not so often used for designing electronic or interactive products. Additionally, they are mainly associated with small-scale making processes or with product design, and much less with the domain of interaction design. However, several studies in interaction design and more broadly in the field of Human-Computer Interaction conducted lately include craft materials, mainly looking at the concrete challenges of combining craft materials with electronic components (Buechley & Perner-Wilson, 2012). Other studies stressed the properties of craft materials in relation to interaction (Vallgårda, 2008), or explored new ways of crafting with personal fabrication tools (Tsaknaki et al., 2014; Zoran & Buechley, 2013).

Integrating craft materials in the design of interactive artefacts has been also discussed from a perspective of how such materials could act as eco-friendly alternatives to plastic composites for example, which today dominate the market of electronic products. Verbeek and Kockelkoren (1998) were perhaps the first to highlight the topic of surface appearance of products in relation to crafts and materiality from a perspective of sustainable design, but also in relation to concepts such as longevity and obsolescence. Finally, craft materials are embedded with cultural values, which might influence social practices and use contexts that emerge around them. Looking at the design of hybrid artefacts from this perspective poses new challenges for product and interaction designers in regards to the concrete choice of surface materials, which inherently guides the interactions performed with the artefacts (Fernaeus & Sundström, 2012; Giaccardi et al., 2014; Robbins et al., 2016).

Experiential Properties of Interacting with Craft Materials

In this section we present concrete examples of how the craft materials leather, metal, textile and wood shape the experience of interacting with artefacts, when one of those materials are on their physical surface. We will do this by distinguishing between three particular experiential properties: a) sensory experience, b) physical manipulation, and c) interactive behavior. We have extracted and adapted those three experiential properties from Giaccardi and Karana's framework on *materials experience* (Giaccardi & Karana, 2015) and Fernaeus et al. (2008) *action-centric* perspective on tangible interaction. The materials experience framework represents a dynamic relationship between materials, people, and practices, according to Giaccardi and Karana, and consists of the sensorial, interpretive, affective and performative levels through which materials (and through those artefacts) are experienced (Giaccardi & Karana, 2015). On the other hand, the *action-centric* perspective on tangible interaction, describes the qualities of tangible user interfaces as *resources for action*, and how this perspective may be reflected in design (Fernaeus et al., 2008). Fernaeus et al. distinguish between four types of actions on tangible interactive artefacts: physical manipulation, digitally mediated action, perception and sensory experience, and referential, social and contextual action. Our proposed experiential properties build in particular on three of these four types of actions, providing a means of analyzing the interaction with materials from different perspectives with respect to the role of the craft materials in interaction. We also incorporate the experiential dimension from the materials experience framework and in particular the relationship between materials, practice and experience, where we here emphasize the crafting practices as important for how the experience with the materials unfold.

The purpose with our distinction between the three experiential properties is to illustrate possible ways in which a craft material can influence the interaction with an artefact focusing on the sensorial experience craft materials offer, or on how they afford particular physical manipulations in regards to the ways they can be given shape. But also on how they can offer interactive qualities based on their electro-conductive properties, for example how they can be integrated as parts of electronic circuits, and what qualities this may bring to an interactive setting. Below we use the proposed material properties to analyze how the surface of interactive artefacts can be a resource for actions and sense making and how we may address those qualities, when designing interactive systems. The aim of providing those examples is to offer empirical material for other design researchers to reflect on the use of craft materials on the surface of interactive artefacts, but also to suggest ways in which the particular craft materials being in focus here, leather, textiles, metal and wood, can influence the experience of interacting with an artefact, in different ways. Most importantly, the presented cases should be read as illustrative examples, aiming to open the space for further discussions and studies on this topic, rather than as a complete analysis of the experiential properties of specific craft materials.

Sensory Experience

Tangible interactive artefacts can be physically experienced with our senses, through smell, touch or auditory feedback. The sensory experience is what Giaccardi and Karana referred to as 'sensorial level' on the materials experience framework (Giaccardi & Karana, 2015), but it is also related to the 'perception and sensory experience' of the action-centric perspective by Fernaeus *et al.* (2008). Being the only part of the interactive system that is seen, but also available to be touched, an artefact's outer physical surface holds special potential for triggering intriguing and evocative sensory experiences, especially in regards to the artefact's interactive behavior. For example a casing or the surface of an interactive artefact may be designed to shield off, modify or even amplify all kinds of output modalities, such as audio, heat or vibration that an interactive device may generate, through speakers, thermoelectric modules, motors or other components. As discussed by Jonsson *et al.* (2016), the physical sensations that heat or vibration modalities can evoke may depend on the choices of outer surface materials to a great extent, and can affect the sensitivity of different body parts or the degree of subtleness of the experienced interaction.

Example: Leather as surface material

Craft materials, as every other material, provide very particular sensory experiences, when used as surface materials of interactive artefacts due to their unique properties, which can be actively used for designing the interaction with an artefact. Leather with its intense smell and tactile properties, textile being soft and flexible, metal being shiny and cold material, and wood being rough and grainy. One example from our own design practice that illustrates how leather invites for tactile interaction, and how this sensorial experience influences the design decisions taken and the interactive properties of an artefact, is the *sound box* interactive table (Tsaknaki et al., 2014). In this example, the tactile properties of leather played a significant role in how the interaction with the sound box was experienced (Figure 1a). This table consists of a touch sensitive leather surface on the top, which reacts to pressure by playing different recorded sound files, when different areas are pressed. The tactile properties of leather, in combination with the curiosity of touching the leather surface in order to feel its texture and quality, invited for gently touching and stroking rather than hard pushing, when the sound box was tested at an exhibition setting in Berlin (Figure 1b). But since the leather touch sensitive input surface was designed for being triggered with a gesture of vertical pushing, rather than smooth horizontal stroking, the researchers involved had to adapt and re-design the interaction modalities of the table, in order to fit with the sensorial experience that leather evoked. This was done by adding capacitive sensors, which could be triggered with a smooth touch gesture instead of hard pressing. And more broadly, this simple example of using leather as a surface material of an interactive artefact provoked reflections on how leather, due to the sensorial experience it provides and the close-to-skin interactions it invites for, can be used for designing interactive experiences, that other materials, such as plastic or metal, could not provide.

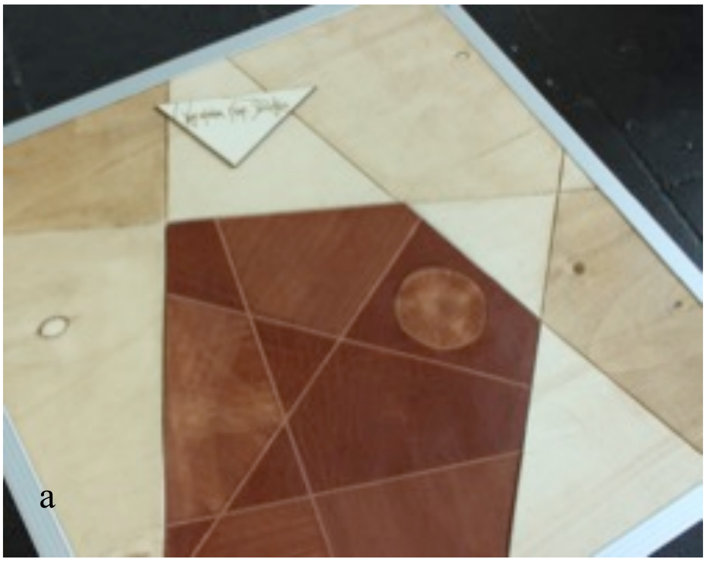

Fig 1. Leather used as a surface material for the touch-sensitive input surface of the *sound box*. The sensory experience of touching leather invited for gestures of gently touching and stroking, which played a significant role in how the touch-sensitive input surface was approached and interacted with.

Physical Manipulation

A central property of physical interactive artefacts is the ways in which they can be physically manipulated with hands and fingers, how they may be attached to one another, and moved about in space. In terms of physical affordances, the surface of an interactive artefact is one of the main resources for users to identify what physical manipulations to perform on the device. Surface appearance and materiality can invite the user to touch, move, or act upon the device in a certain way, and this can change substantially according to the choice of materials. Simply placing an electronic device in a new physical casing thereby affects what users will do with it and how they will treat it, as illustrated previously (Jacobsson, Fernaeus, & Tieben, 2010). Replacing a hard plastic surface with one made of soft materials, would invite for a different handling of the device. Similarly, an object with a rubber or hard plastic casing may be perceived of as more waterproof or robust than one covered in a soft fabric, wood or leather, and this would affect the way the object will be treated or interacted with. The physical manipulations an interactive artefact invites for are also highly dependent on the way the artefact has been made, for example how it has been assembled, or on the surface materials of which it consists.

Example: Textile as surface material

The properties of textiles or other soft materials such as knitted yarns, in combination with their crafting properties, meaning the ways in which they can be given form, can be used for designing particular types of manipulations that could be performed with an interactive artefact. The *Speaker Scarf* depicted in Figure 2a, which is a portable speaker re-designed as a scarf, is an example from our own design research that illustrates how using textiles or other soft materials as surface materials of an interactive or electronic artefact can be a way to design for particular physical manipulations with the artefact. It consists of a fabric speaker, a circuit board, and a switch on/off switch made of conductive and resistive e-textile materials, which is also used to adjust the volume (Figure 2b). Using textile in the form of knitted wool as the surface material of this speaker directed and restricted the design work, resulting in a final form that affords and invites for certain physical manipulation. The Speaker Scarf can be worn around the neck instead of placed on a table surface, inviting for intimate and personal interaction with the speaker. The textile speaker component is small enough to be held inside the palm, and has to be brought close to the ear, when the scarf is worn. This creates a personal experience of listening to music. Additionally, the physical manipulations that need to be performed, when switching on or off the speaker or when adjusting the volume of the music, have been directed by the use of soft materials for designing the speaker. In order to switch the speaker on or off a metallic button has to be inserted in a loop made of resistive yarn, and similarly, by inserting the metallic button in one of the other loops, the volume can be adjusted.

Fig 2. The use of textile and soft materials guided the way the *Speaker Scarf* has been designed, in particular the specific physical manipulations that need to be performed in order to listen to the music. Left: the textile speaker unit and the on/off switch that can be also used for adjusting the volume. Right: Adjusting the volume by placing a metallic button on one of the loops made of resistive yarn.

Interactive Behavior

How the surface can support users to interact with an artefact also depends on the particular inherent properties of the surface materials, for example their abilities to conduct, to resist, or trigger. As a resource for supporting digitally mediated actions or physical manipulation, the design of a physical surface plays a central role in providing particular possibilities for interaction. The physical surface can influence how media content may be manipulated or navigated, for example suggesting possible ways of accessing recorded data, but it can also evoke subtle interactive qualities. It is on the surface that we learn how physical buttons, speech, or gesture recognition software may work as direct controls to actions that a device may perform. The physical surface may for instance indicate how to handle and press buttons, but even when the surface is not responsive as such, its form factors still indicate how the device could be held and manipulated in the engagement with internal sensors, such as accelerometers.

Example: Copper, silver, wood and textile as surface materials

Different types of materials can have very varied ways in which they can be interacted with, and this can affect and direct the experience of interaction. Textiles and soft materials invite for actions of stretching, pulling or squeezing, due to their flexible and soft properties. This is often utilized for making input sensors that can be activated by stretching (Figure 4a), squeezing, rubbing or stroking which would not be possible with other materials that are hard, such as plastic composites, wood or metal. On the other hand, the conductive properties of metals can be used for making buttons or switches by integrating metals such as copper or silver on the surface of artefacts and utilizing the resistive properties of bare skin, as described in (Tsaknaki, Fernaeus, & Jonsson, 2015). In Figure 4b are depicted three versions of simple buttons made of copper, silver and wood, which are utilizing that particular property of metals being conductive, in order to be triggered. This could not have been possible to achieve with other types of materials, such as leather or wood that are not conductive. Another example is wood, which affords to be stacked on blocks for example, and can be used for making sturdy and flat surfaces that can be easily manipulated and interacted with, when used as a surface material on interactive artefacts. One of our master's students at KTH Royal Institute of Technology, John Brynte Turesson, explored wood as a surface material of interactive wearables. In Figures 4c and 4d, laser cut wood has been stacked in blocks and used to make input controls for necklaces that can be triggered when pushed vertically, or slided on two directions. In general, making use of the properties of craft materials can be a way of using those materials for performing the actual interactions, such as pulling, touching, rubbing, stretching, rather than only as surface materials or casings, to protect the electronic components hosted under the surface of an artefact. In that way, surface materials and casings may have the potential of taking a more active role in the interactive behavior of an artefact, which can dynamically influence the experiential properties of an artefact more broadly.

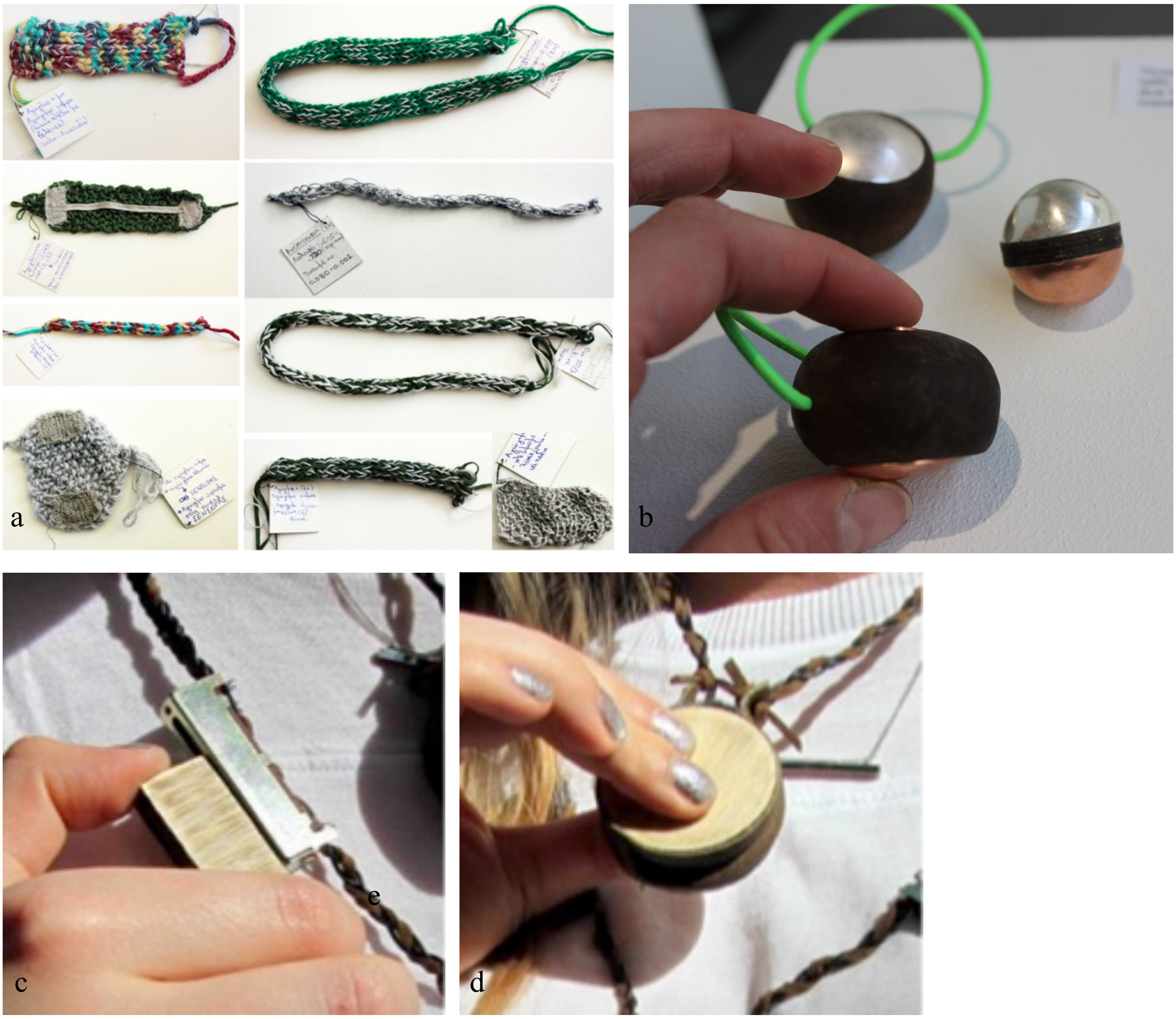

Fig 4. The unique properties of craft materials, based on their abilities to conduct, to resist, or trigger can influence the interactive qualities of an artefact, when used on its surface: a) Input stretch sensors made of conductive and resistive yarns, and textiles, b) Three versions of buttons made of copper, silver and wood. The conductive properties of metals can be used for triggering a button with bare skin, c) and d) Stacked wood has been used on the surface of a potentiometer and a button, due to its property of being sturdy and robust.

Discussion

It may seem redundant to explore artefacts in terms of their individual constituting parts, as in the case with surface materials of interactive artefacts, especially when these parts do not *do* anything actively. However, by presenting simple examples we have shown how the mere perceptual features of objects, or a seemingly ‘dead’ surface appearance sometimes becomes an important resource that can guide the interaction with an interactive artefact, in a very concrete way. Especially craft materials, which are the focus of this paper, when used for designing interactive artefacts can contribute to the experience of interaction, due to of their physical perceivable properties, or more unique attributes in regards to the crafting or fabrication techniques that can allow or the different forms they can take. We want to acknowledge however that we have only given very few illustrative examples and that exploring more broadly the experiential properties craft materials can provide when used for designing interactive artefacts is a space that demands further studies.

The aim of this paper was to present how the use of craft materials on the surface of interactive artefacts provide very particular experiential properties in interaction. Even though this analysis reads as a meta-reflection of already designed interactive artefacts rather than a concrete suggestion of how to make use of those experiential properties in a design process, we believe that by highlighting the three properties of craft materials, sensory experience, physical manipulation and interactive behaviour, others can benefit from that and even use them in a design process. If designing a wooden surface that responds to touch, for example, by unpacking the three experiential properties during the design process, would help in bringing forth what is particular about wood and how its properties can be best utilized for interacting with the surface, and consequently with the artefact.

Reflecting on the three categories of experiential properties presented above, it becomes obvious that they are overlapping to a great extent and a clear distinction between the three would be difficult to make. For instance, we presented the experience of interacting with the leather pressure-sensitive surface of the sound box as a sensory experience in regards to the very particular tactile properties of leather. But it could as well be described from a perspective of what types of physical manipulations leather invites for, in regards to the crafting affordances of leather and how that would influence the physical manipulations with an interactive artefact, when leather would be used as a surface material. Similarly, the Speaker Scarf has been discussed from a perspective of how the soft textile material used for giving form to the speaker directed the design of this artefact, especially in regards to how the speaker can be physically manipulated. But at the same time, the textile material being soft and warm provides a very particular sensory experience while listening to music that other, more common materials used for designing a mobile speaker, such as plastic composites, do not provide.

A particular aspect that we would like to draw attention to is that designing interactive artefacts with craft materials on their surface, apart from provoking reflections on the notions of craft more broadly, might shift the way those artefacts will be taken care of. Designing the surface appearance of an artefact involves, apart from supporting particular interactions with it, how actions such as repair, maintenance, modifications or recycling could be supported. Caretaking includes possible ways of changing or charging the batteries, switching the device on and off, how it can be cleaned or how it may be physically moved and stored, among others. Including materials such as wood, leather or metal in a design may facilitate caretaking, as observed in practices of traditional crafting in which materials such as leather, wood or precious metals were involved (Rosner & Taylor, 2011; Tsaknaki et al., 2015). A crafts approach on the design of interactive artefacts can also highlight the impermanent nature of interactive technologies, being fragile and short-lived, and possibly confronting this reality, as described by Tsaknaki and Fernaeus (2016).

Verbeek (2010) discussed that apart from robust designs, another way of extending the life span of a product would be to attack cultural factors that make products abandoned long before they become technically worn out. Based on this idea, the cultural links and values that exist to objects made of craft materials such as leather or textile may be transferred to electronic products, when such materials are integrated in their design and thus contribute with new meanings or increase their value, and therefore their longevity. This is even more interesting when looking at the potential of combining so-called traditional crafts with high-tech tools, materials and design processes. If artefacts would be designed in the intersection of textile handicraft, mechatronics and interaction design, or silversmith crafting and interaction design what particular meanings and values such artefacts may carry and reflect? But also how would such hybrid artefacts influence the practices that will emerge around them, in relation to the social and cultural context in which they will exist?

The above questions point to the fact that artefacts and consequently surfaces are part of a social and cultural context rather detached from it, and should be studied as such. We find this to be a highly important aspect, since it is when an interactive artefact is contextually situated that its features may be used as an indicator of the current state of activity, as a resource for attracting people's attention or for personally reflecting on, or engaging with it. Giaccardi and Karana (2015) stress the importance of situating artefacts socially and culturally, in relation to people and practices, which consists the performative level of their framework. Similarly, Fernaeus et al. (2008) in their action-centric view on tangible interaction discuss that referential, social and contextually oriented action is one way that a tangible artefact may work as a resource for action. The reason why we did not include this aspect in our analysis of the use of craft materials in interactive artefacts is because we wanted to focus on the inherent and craft properties of specific craft materials, reflected on the illustrative design cases we provided. Those hybrid artefacts have been designed with a focus on materials and making, instead of addressing particular use contexts. However, we are planning to expand on how craft materials used as surface materials of interactive artefacts influence the interaction, when placed on a social and cultural context of everyday use practices.

Additionally, studying surfaces in context and in relation to the passing of time can reveal new aspects in regards to how a surface can concretely influence the interaction, since the different forms a material surface can take, deliberately or unintentionally, play a significant role in how the artefact will be experienced during its lifespan. In particular, the ways in which craft materials change over time, play a significant role in how such materials, being on the surface of artefacts will affect the context of use but also interactions and relationships that may emerge between the artefact and potential users, as discussed by (Giaccardi et al., 2014; Robbins et al., 2016; Rosner, Ikemiya, Kim, & Koch, 2013). As mentioned by Verbeek and Kockelkoren (1998*,* p. 30) "some materials, such as leather, may also become more beautiful when used for some time, whereas a shiny, polished chromium surface starts to look worn out with the first scratch". Signs of aging developed on a material surface can take the form of traces, patina, cracks or change of color among others. In that way, wear and tear alters the tactile and visual properties of a surface, and such signs could be perceived and interpreted in a variety of ways. For example, the patina that materials such as copper, silver, leather or wood develop on their surface over time could be used for creating patterns of interaction and use, or as a visual element to reflect upon usage, signifying for example areas or buttons that have been 'pushed', or 'touched' more than others (Tsaknaki et al., 2014).

Conclusion

In this paper we looked at the surface of interactive artefacts, and we focused on the experiential properties of surfaces, which even though they do not 'do' anything actively, are still a very central part of how an interactive artefact is experienced, and physically interacted with. Specifically, we looked at how the craft materials leather, wood, textile and metal, when used as surface materials of interactive artefacts can influence the experiential properties of interaction in regards to sensory experience physical manipulation and interactive behaviour. Concluding, we believe that the way an interactive artefact is experienced is not only a question of what is displayed on its surface or how it functions. It is also important to consider how the artefact as a whole is made sense of in active engagements by people, based on personal experiences, expectations but also on the surface materials that are the 'mediators' between the artefact and the surrounding context. Physical surfaces are a rather important feature for interaction designers to actively work with, and deserve further studies in this domain.

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