

Manifestations of Everyday Design: Guiding Goals and Motivations

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ABSTRACT

This paper explores the relationship between goals, materials and competences in the practice of everyday design. Appropriations and creative uses of design artifacts are often reported in terms of outcomes and goals; however, we observe a gap in understanding how materials, tools, and competences are also involved in these processes. We conduct a multiple case study of three groups of everyday designers: families, hobbyist jewelers, and steampunk enthusiasts. We provide a description of the aspects of meaning, materials, and competences, as well as how they are interrelated, for each case. Our findings show that amongst these three aspects of the practice of everyday designers, it is the meaning of the practice that acts as the strongest motivator for practitioners. Materials, tools, and competences are hence largely determined accordingly. The implications of this study propose ways to design for practices with different types of meaning: foundational, aesthetic, and aspirational goals.

Author Keywords

Everyday Design; Appropriation; Steampunk; Jewelry; Families; Practice Theory; DIY; Hobby.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design; Theory.

INTRODUCTION

The process of transforming and appropriating objects of design has nourished research in different areas in interaction design and human computer interaction (HCI) for the past years. Through observations and analysis, research explored how people engage with objects and systems not only to use them as they were designed, but also in different, new, innovative, and creative ways. These

actions were not necessarily intended by the designer(s), yet people transform and re-design artifacts so they become personal, based on their understanding of the current and future situations [8]. Previous research has shown that once the artifacts leave the designer's drawing table, the design process does not stop: it can be pursued through customization [7], reuse [11], appropriation [3, 4, 21], do-it-yourself (DIY) projects [5, 6, 13] and everyday design processes [20, 21].

An everyday designer is a "creative agent among other everyday designers who together create and redesign artifacts long after the products have left the hands of professional designers." (p.365) [22]. The term everyday designer originated from a study of families in the home where a type of shared creativity that helps us navigate daily activities and events was observed [20]. Through their observations, the authors look at family members as everyday designers, people who show resourcefulness and adaptivity leading to unique design outcomes. Everyday design is a powerful lens for focusing on more meaningful relationships with objects because it highlights how people engage with those objects, not only through use but through the making, transformation, and adaptation of artifacts.

This research leads to a reconfiguration of who the user is that moves beyond a task-oriented perspective in order to encompass users' creativity and resourcefulness [22]. This new identity reframes the user through a more holistic lens that looks at the multiple and various goals and motivations one might have for using design artifacts. This reconfiguration of the user and this broader understanding of the life of objects after they are designed also hold sustainable implications [11, 22].

Everyday Design Practices

Most research about appropriation, everyday design and do-it-yourself communities looks at the goals and outcomes of the practices of making as well as at the communities of makers. In this paper, we propose that, to provide strong starting points to pursue research and design for a longer and more diverse product life, we need a more detailed view of the practices of everyday design. We choose to look at everyday design through the lens of social practices in order to explore the relationships between goals, tools, materials, and necessary competences or skills within a practice. Practices can be viewed as a unit of analysis for the social life. They refer to the *implicit*, *tacit* and

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unconscious aspects of life often underexplored in sociological studies. A practice is a routinized type of behavior that combines aspects of “body, mind, things, knowledge, discourse, structure/process, and agent” (p.250) [12].

More specifically, we base our analysis in Shove et al.’s [15] framework of social practices. The authors propose that practices are constituted of three aspects: meanings, materials, and competences. Meanings refer to goals and aspirations of practitioners, they relate to the reason and motivation for doing a practice. Materials are all physical things that are used in the practice, including the body, objects, technologies, and tools. Finally, competences cover the skills, the techniques, and the know-how needed to accomplish actions of a practice.

Our goal in this paper is to reveal how these aspects of practice (meanings, materials and competences) are interrelated in the creative practices of everyday designers and makers. Through our analysis, we seek to investigate if there is a dominant aspect that can influence and frame the other two aspects. For instance, are materials central to the practice and have such an importance that they configure the motivations one can have? Do competences and skills limit or open possibilities for manipulating materials? Do motivations and goals triumph all and materials and competences are shaped to achieve the envisioned goals? By revealing which aspect might be determinant for the others, we can leverage this knowledge to orient future design of interactive technologies.

We explore those configurations of practices within three different groups of non-expert designers: families, hobbyist jewelers, and steampunk enthusiasts. By comparing them, we uncover the differences and similarities of each practice. We also use these three cases to explore the interrelations between meanings, materials, and competences.

In the following section, we provide a brief literature review of relevant research about everyday design and do-it-yourself communities. In the next section, we present our multiple case study approach and the analytical framework of practice theory. Further, we present our description of the practices of everyday design of families, hobbyist jewelers, and steampunk enthusiasts, by emphasizing the relationships between the aspects of meanings, materials, and competences. We conclude with a discussion of the importance of meaning, the evolving nature of practices and the implications for the design of interactive technologies.

LITERATURE REVIEW

Everyday design

The premise behind everyday design is that people creatively and constantly appropriate and transform objects around them. Domestic studies have previously focused on understanding the creativity of home dwellers. For

example, Taylor and Swan [18] observed the diverse systems used by family members to organize their homes and to communicate in their everyday lives. They argue that technologies should be designed to accommodate for the very rich and artful ways in which people organize their homes, and that designers should provide resources to foster these behaviors. Crabtree and Rodden [2] use ethnography to study domestic routines of communication and organization structures to support messaging. Tolmie et al. [19] observed routines (what they consider to be the “glue of domestic life” (p.399)) of families and neighbors as a way of finding opportunities for making technology as ‘invisible in use’ as routines. Wakkary et al. [20, 21, 22] have done ethnographic studies of families where home dwellers are viewed to creatively and resourcefully appropriate artifacts and surroundings in the home. The ongoing process of adapting systems to fit routines and activities in the home is described as design-in-use, which is a type of design that is in situ and in synchronicity with daily actions and routines [22].

This corpus of research highlights the everyday creativity of people, the uniqueness of designed systems, and the mutual intelligibility that flows between group or family members.

Do it yourself (DIY)

Researchers have focused not only on the appropriation of objects and surroundings, but also on how individuals (who are not designers) create explicit design projects resulting in the fabrication of objects. DIY is focused on the act of making, but it is also a reflection of who people are. Spencer [16] argues that shaping people’s identity is at the heart of DIY: “the DIY movement is about using anything you can get your hands on to shape your own cultural entity: your own version of whatever you think is missing in mainstream culture” (p.11). Paulos [10] reminds us that the origin of the term amateur comes from *amator* in Latin, which means to love, and that being passionate about a project is also central to the DIY culture.

Studies of crafts and hobbies such as gardening and knitting [5], DIY communities [6], and hacker subcultures [13] also highlight the creativity and resourcefulness of individuals who create things outside of the common industrialized production model. For example, Ikea Hackers deconstruct and disassemble Ikea products to reassemble them in new personalized objects. The hackers then share their process and outcomes online with other hackers [13].

Both research in everyday design and in DIY communities demonstrate that people are creative, resourceful and most importantly that they do not use design artifacts the way designers had intended. By reading previous research, we understand that there are different types of makers and non-expert designers. However, there is a gap in our understanding of this continuum of makers. We can further explore how the goals of each groups influence their ways of doing, and their choice of material and tools. Such an

exploration would help us see the diversity of makers' practices and would lead the way to designing for these multifaceted and various practices. Interaction designers and the HCI community can learn a lot through this research by transferring these observations to different types of uses of interactive technologies.

OUR RESEARCH APPROACH

This paper is based on a larger study exploring practices of everyday designers. In this paper, we exclusively focus on the aspects of goals, materials, and competences of practitioners. We also concentrate on the relationships between these aspects and how they are linked through strategies. Our approach is in part based on the framework developed by Shove et al [15] to describe the dynamic aspect of social practices.

We chose three groups of people who design and appropriate in their practices: families, hobbyist jewelers and steampunk enthusiasts. These groups were chosen for their respective practices, but also for the range of motivations, skills and strategies used across the cases. Following is a short description of each group and the methods for collecting the data in each case.

The study of practices of families draws upon a study that was conducted in 2005-2006 [20, 21] with the goal of understanding the creativity of people in their everyday life. The original study is an ethnography of four families in East Vancouver, BC, with more than 460 hours of observation and interviews. The families studied were two married couples and two mothers with live in partners with children from 2 to 13 years old. We conducted a secondary analysis of this study by reviewing the photographs, videos, and notes from each session with the families to highlight the various aspects of the practices of everyday design. Families bring a perspective on the everyday life and on acts of making and design as part of people's routines. Most acts of appropriation are generally unconscious and tacit. This group was important for the study to represent everyday designers who design through design-in-use in order to get by daily activities and routines.

Hobbyist jewelers were chosen because the making and material aspects are central to the hobby. Six hobbyist jewelers (all female, age 23 to 50 years old) were interviewed and visited over one month. Four live in Vancouver, BC, and two live in Montreal, QC. Their professional occupations are varied: student of applied zoology, landscape architect, elementary school teacher, reporter, artist, and PhD student. All participants make jewelry as a hobby, and in one case, as a side business to her daytime job. Hobbyist jewelers were selected because they represent an amateur equivalent to the professional practice of jewelry making and silversmithing. Jewelers can take classes to learn their practice and consult a wide range of books documenting different jewelry techniques. We also chose this hobbyist group because of the important

aspect of aesthetic in their creation, which is different than what we know about everyday design in families.

Steampunks are driven by a philosophy questioning the current consumption model and therefore is likely to show a different view of the *user* [17]. The steampunk subculture re-imagines a world inspired by the Victorian and Edwardian eras, where brass, leather, and wood constitute common fabrication materials and where steam is used as a main power source. Onion [9] writes in the *Journal of Neo Victorian Studies*: "Steampunks seek less to recreate specific technologies of this time than to re-access what they see as the affective value of the material world of the nineteenth century" (p.138) [9]. There is no professional equivalent to this practice. This group represents expert amateurs who share a common vision of the world. Eight Steampunks were interviewed and visited face-to-face or on skype. Three live in Vancouver, BC, one in Edmonton, AB, two in Toronto, ON, and two live in the Montreal, QC. Their ages range from 28 to 52 years old, three are female and five are male. Their professions are very diverse: family doctor, programmer, prop maker for movies and TV shows, psychologist, employee at a fast-food restaurant, and administrative assistant in a University department.

For the hobbyist jewelers and the steampunks, one of the authors met with each participant 3 times for 90 minutes each time. The data was collected in three different ways:

- Semi-structured interviews (addressing motivations and goals, outcomes, tools, materials, competences, and strategies).

- Photographic inventories [1] (including pictures of artifacts, materials, tools, environments, and actions).

- Video walk-through of artifacts or processes (short video where participants explain in detail why and how an artifact was made (materials, tools, and strategies), or the process for making this object).

In addition, some follow-up emails were sent to participants when more questions emerged during the data analysis.

In brief, we chose families to observe more tacit and unconscious everyday design, we selected hobbyist jewelers to understand the importance of aesthetic and the relationship to a professional side of a same practice, and we chose steampunk enthusiasts for their powerful ideological aspect and their strong community sense. We hypothesize that they all have similarities in how they view objects, and in how they appropriate and adapt artifacts, but we expected to see differences in the ways they achieved their acts of appropriation and transformation.

FINDINGS

We present the practices of families, hobbyist jewelers and steampunk enthusiasts. We describe each group through the different strategies they employ, which combines meanings, materials and tools, and competences.

Families

Supporting daily activities

The practice of everyday design in families generally aims at supporting the current lifestyle of family members. Appropriations of objects and their transformations are rarely the focus or the reason for making; rather, making is used as a way to facilitate other activities in the home. Accomplishing necessary tasks is a motivation for modifying things or reusing objects in different ways. This particularly happens in smaller spaces or when activities require a lot of space for a relatively short period of time. For example, Cate¹, a mother, uses the railing to hang washed clothing pieces that cannot go in the dryer.

In order to further describe materials in everyday practice of families, we discern attributes qualifying the objects, such as flat, hollow and protruding. Flat surfaces can invite family members to place other objects on top of them. For example, the top of the fridge was often used as a surface to either hide objects from children, or as a place to leave documents or objects that did not have another storage place. This finding was presented as part of the initial study [20] and similar conclusions were drawn from this second data analysis. Objects that have protrusions, parts that reach out of the main object, are mainly viewed as places to hang things from. Chairs and stair posts are commonly used to hang jackets, and stove and fridge handles to hold dish clothes.

Ad hoc improvisations

Spontaneous and temporary actions of appropriation help families move from one activity to another, a necessity as well. In Lori and Abe's family, it is common to leave artifacts by the door, such as garbage, Abe's equipment for a music night, or a lunch kit as a way to remember to bring them outside. This example shows that family members use different parts of the house and certain surfaces as reminders for future activities.



Figure 1. Lori uses her wallet to write as an ad hoc solution for a flat surface.

Since most appropriations happen through ad hoc events, materials are often present around in the house, ready at hand. Objects can be categorized as architectural structures

(e.g. door, half wall), furniture (e.g. fridge, chair), and everyday objects (e.g. knife, bowl). We observe that these objects and materials are used as-is by the family members and that the form factor has a large influence on how families can use or not an object to continue to support ongoing activities in the house through design-in-use and spontaneous appropriations. Family members are experts at reusing objects as-is to accomplish a different function than the objects' intended ones. Hanging jackets on chairs, using the piano bench as a table, and using a magazine to collect fingernails exemplify well the variety of objects that can be resourced in the home. Similarly to reusing as is, jury-rigging entails making the best out of a current situation, and providing a quick fix. For example, Lori uses her wallet as a flat surface to write something on a piece of paper on the go (figure 1).

In general, most of the materials used do not need a physical transformation to be appropriated. Hands are typically the only tools needed to reuse artifacts, organize them differently or change their context of use. As we observed and categorized the types of materials and tools used in families' everyday design, we also understood that these choices (maybe involuntarily) do not require particular knowledge or specific skills to use. One does not need to learn how to leave things next to the entrance door, or how to hang things on a railing.

Thinking creatively, iterating, and adapting

Different types of competences related to how family members view objects were observed. Family members show the ability to think creatively, or in other words, to see opportunities presented by objects ready-at-hand in order to accomplish design-in-use. For example, Cate recognizes that a phonebook has the right shape to stretch her calves after running and Kerry sees a toy hat as a container to move other toys to a different room. Both examples require seeing objects through a new lens that can reveal new potential uses. This ability can also be seen as a common strategy that helps support everyday activities: reusing objects also means resourcing materials that are available in the context of a need. This strategy is closely related to the competence of seeing opportunities in objects.

The abilities to iterate and adapt systems are central to the practice of everyday design in families. They have ever changing routines; hence, systems need to follow this constant evolution. For example, Cate started to create a second iteration for her recipe organization system because she was not satisfied with the first one (a classifier folder divided alphabetically). The second system she developed, in addition to classifying the recipes by topic (appetizer, entrée, and dessert) like in her first system, allowed her to create two folders, one with tried and loved recipes, and one with recipes to try. As she explains, the new system prevents her from losing small pieces of paper holding recipes: once a recipe has been tried and loved, she glues it onto pages of the folder.

¹ All names are pseudonyms to preserve participants anonymity.

In summary, we observed that families' goals are usually to get by with daily activities and to continue with their routines. In order to accomplish this goal, they do not aim at developing new competences and do not try to find specific materials. Family members mostly use what is around and available to them and accomplish design-in-use while working on ever changing systems. Simple and available materials are reused, appropriated, and sometimes transformed through competences that do not require specific skills or techniques and that can be accomplished mostly by hand.

Hobbyist jewelers

Aesthetic motivation

Hobbyist jewelers' motivation resides in the possibility to accomplish something unique and beautiful with their own hands and potentially to share the finished product with others. This aspect of their practice challenges the common consumption model of buying anonymous and mass produced products. It supports the feeling that something made by hand and by someone you know is more special, meaningful and represents you better than what is available to buy in stores. In an interview, Sophie, a hobbyist jeweler, recalls creating a necklace with a miniature pocket knife for her sister and how this was more special than creating the other pieces she sells through an online store. Moreover, Veronica explains that the conceptual part of making jewelry for family and friends is the most challenging, but can also lead to the most rewarding experiences of making. She says:

I need to be observant of what they would wear, and what they like. It is very different from a mass production model, where I make 60 or 75 at a time, and the goal is to make the production cheap and fast. As a hobbyist, a necklace can take multiple hours.

The importance of creating unique pieces pushes hobbyists to collect particular materials and to pay attention to each detail of their creations. Aesthetic motivation is also an important generative goal in hobbyist jewelry. Many projects stem from materials that were acquired because of their look and feel. For example, Allison, another hobbyist, bought dried rose buds in a Chinese market because she appreciated that no two were the same. She did not have a precise idea of her project, but the materials urged her to think about how she could use them. Shape, weight, color, texture, and size are all important attributes that influence how the jewelers assemble and model pieces.

Collections of found objects also include pieces of vintage jewelry such as metallic chain, medallions, pendants, stones, and even small characters for model making. Natural materials are also used, such as dried sea stars and dried rose buds. Those unique objects and materials are generally combined with materials from scratch such as metal wire and plates, beads (acrylic, metal, glass, stone), feathers, and clay as well as basic jewelry pieces such as

hooks for earrings, pins with loops or with flat ends, loops, and chains. Hobbyist jewelers show the use of an interesting combination of found objects, basic materials and pre-made jewelry pieces. They show a fluid ability for assembling pieces and are able to cleverly use modular pieces as a way to connect found objects or irregular pieces.



Figure 2: Claire conceptualizes her necklace by playing with materials.

The importance of aesthetic in jewelry making also reveals that hobbyist jewelers develop a strong ability to conceptualize their pieces sometimes through drawings or by playing with materials without assembling. For example, Claire places charms and chains on the table to see what a necklace could look like (figure 2). She moves the parts around to see different possibilities and then makes her choice. Participants mentioned that conceptualizing is often related to the need to emphasize artistic aspects such as composing and balancing textures, colors, materials and weight. Here, we observe the importance of the aesthetic goal that dictates a large part of the practice. It largely influences the materials chosen and demands certain competences in the assemblage of those materials. In the next section, we also see that the materials chosen shape what tools are used and what strategies are employed.

The pleasure of making and experimenting

A second important motivation for hobbyist jewelers is the pleasure for making things with their own hands. The simple act of assembling things, discovering techniques and overcoming challenges brings satisfaction to hobbyist jewelers. For example, Allison says that discoveries and successes in techniques are the reason why she continues doing her work: when she *"figure[s] something out, it's almost more rewarding than the result itself"*. As demonstrated by many jewelers' projects, the ability to experiment is often at the heart of developing new techniques for jewelry making and using the unique materials collected. For example, this is how one of the authors described in her field notes Allison's cycle of iteration and experimentation for developing a way to pierce dried rose buds in order to add a hook:

Allison started to pierce dried rose buds first with a pin, by pushing on it, and turning it, but it did not work very well. So she looked for a different technique to make a good hole in the buds. All of a sudden, she thought about heat. She grabbed a candle, and heated a pin. And it worked. She says: "flash of insight, I just kind of knew. I wasn't sure it was going to work".

Experiments are not often prepared in advance and the inspiration of the moment leads hobbyist jewelers to use many tools that surround them. Before turning to using any tools, jewelers use their hands to make and assemble things in their practice. A participant explains that only when hands fail to do something she turns to other tools. A great variety of objects found around the house are used by hobbyist jewelers as a way of modeling the pieces they work on. Claire uses various objects to wrap around and shape silver wire into earring hooks. She resources glasses, small bottles, and handles of other tools like a hammer and cutters. Similarly, in order to shape Fimo, a soft colored clay that hardens when cooked, Lucia uses her dissection kit from biology class, spoons, a pill bottle to roll it, a straw as a dye, a pasta-making machine to flatten it and mix colors (figure 3), and any other tool she finds ready at hand.

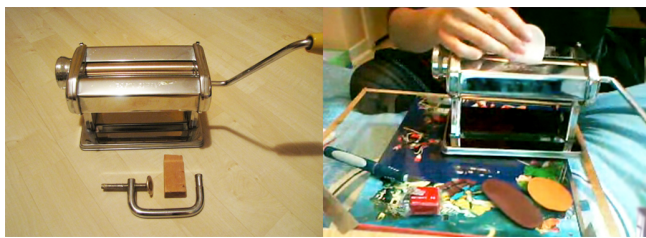


Figure 3: Pasta machine to flatten Fimo.

Letting materials speak

An important strategy for hobbyist jewelers is to let materials speak and act based on this exchange between the material and the practitioner. This strategy is directed by the aesthetic motivation of creating unique pieces with found materials and is also reflected in the motivating pleasure of making. This strategy combines both these goals and is central to the practice of hobbyist jewelers. The concept of letting materials speak was theorized by Schön who defines it as a *reflective conversation* between the practitioner and the situation (and materials) [14]. As the practitioner reframes a problem, he discovers new possibilities that then inform further action [14]. In jewelry, as practitioners move materials and try things, the materials speak back, telling the jeweler what decisions to take. This is crucial in the conceptualization of pieces. For example, in the creation of stone pendants, Allison explained that the stone itself plays a defining role for how the final piece will look. As she wraps the wire around the stone, she follows the angles created by the wire and the stone. For Veronica, materials have intrinsic properties and, as she assembles pieces, she says she cannot impose her own ideas on the materials; conversely, it is the material that leads her aesthetic exploration. Conversations between jewelers' ideas and their materials can take time, sometimes days. Jewelers sometimes let pieces sit on their desks before assembling them, to make sure they are pleased with the configuration.

In addition, serendipitous discoveries are part of what hobbyist jewelers called "*how things just happen*". There is a certain amount of unconscious action and movement in

the making of jewelry, which leads to desirable outcomes by accident. Often, the materials themselves guide this process. In describing her process for the creation of stone pendants, Allison says: "*I don't pay too much attention, but the wire always ends where the hook is supposed to be*".

In conclusion, for hobbyist jewelers, a main goal is to make aesthetic jewelry pieces for themselves and for others and to enjoy the process of making them. Materials are carefully chosen, assembled and transformed with various accessible tools. Practitioners respect the nature of the materials in their creation. The pleasurable experience of making jewelry is augmented by discoveries, new techniques and challenges while modeling and assembling pieces.

Steampunk enthusiasts

Creating a steampunk world

The main motivation for steampunk enthusiasts to make their machines and costumes is to create and realize what a steampunk world could be, and to show how it would look and feel. There are deep implications in revisiting how most industrially produced objects are made and how they are represented to the world. The possibility to embody an alternative to the current mass consumption and production cycle serves a core incentive for creating steampunk machines and costumes. Even if the "cool aesthetic" first caught their eye, it is the realization that they do not need to rely on mass produced goods that constitutes the heart of why they continue to be engaged in steampunk. Participants state that with steampunk they are able to gain back a control over the fabrication of their everyday objects that was lost with industrialization. Some participants also explain how surprise and amazement are part of the realization that they are able to make much more than they thought they could.

Based on this reflection about the industrialized world, steampunks developed strategies to create their own steampunk world. For instance, the strategy of creating a character is often used to give a direction to the machines and outfits steampunk enthusiasts make. For example, Aaron, an enthusiast from Montreal, created the character Baron Celsius Von Fahrenheit who is the inventor of the CELL (the Compact Electromagnetic Linguistic Launcher), a compact, mobile device that can allow people to communicate. With this character, he can generate different narratives when explaining what his machine does.

In the steampunk community, we observe a high importance of the story surrounding produced costumes or machines. The ideology of steampunk strongly influences the design decisions during the creation period, as Tanenbaum et al highlight [17]. The steampunk subculture emphasizes the physical and visible aspects of machinery such as gears, coils, springs, gauges, and pipes. Hence, participants look for these antique objects as well as for materials that represent the Victorian era, and therefore the steampunk aesthetic, such as brass, copper, leather, and old

wood. Materials are acquired over a period of a few months to multiple years at flea markets, garage sales, garbage, antique shops, second hand stores, and Ebay.

In addition to real antiques and mechanical pieces, steampunk enthusiasts do not limit their imagination to finding parts or materials that could be from the Victorian era. Unique shapes displaying curves and ornamentation are also acquired, independently from the color or texture, since, as Kenneth says, *"everything can be painted!"* Objects that seem easy to disassemble are also chosen for the potential parts they hold. A large variety of objects are appropriated and repurposed into steampunk machines and costumes. As an example, in the fabrication of the CELL, Aaron repurposes a basketball pump into a piston (figure 4), a wine wood box for the core piece, a toilet ring to frame the porthole, and slow motors from cardboard displays for activating the key and piston .



Figure 4. Appropriated basketball pump for a piston.

A central strategy is to make believe both in terms of functionality and materials. Participants explain that the inside of the machines do not need to be well finished, it is only the parts that others can see that need to be convincing. Using fake materials can also help reduce the weight of some props, allowing more comfort during long days at conventions. Paint is one of the best ways to transform plastic material to make it look like metal.

In addition, some steampunk enthusiasts start to explore how to transform and reuse electronic components of artifacts. They not only change the frame (for example, on computer monitor screens), but they also appropriate controllers for electric garage doors to control small animated props. Simpler circuits with basic switches, resistors, LEDs and small motors are also created to animate the steampunk machines and costumes.

Tools and competences to support steampunk ideas

Following the variety of artifacts and materials used by steampunk enthusiasts, they also utilize a wide range of tools. In general, tools are not specific to the steampunk practice; they are handyman tools, clock repair and jewelry tools, sewing tools and craft tools. Tools generally serve for disassembling, joining, cutting, shaping, cleaning and finishing. However, similarly to jewelers, observations show that steampunk enthusiasts use their hands as basic tools for assembling, verifying and modeling parts.

While some participants use tools they already owned, others modify or create their own. For example, Adrian made his own polishing machine with a motor, a mandrel, buffing wheels, and a cookie tin that he cut in half and resoldered together to create a protection case (figure 5). This example demonstrates the ease with which Adrian can assemble and model pieces to serve any purpose.



Figure 5: Homemade polishing machine.

Tools for joining are varied and adapted to many situations. Multiple types of glues such as epoxy, resin bond for plastic, gorilla glue for metal, fabri-tag for leather and fabric, and the hot glue gun are widely used by many of the participants. The hot glue gun is a tool that is either adored or hated by steampunk enthusiasts. It is recognized to be a great tool for quick fixes on almost any material, and it is also known to be used to fill in cavities and isolate parts of circuits. However, some enthusiasts prefer the use of the 'right' glue for higher quality projects and durability issues.

Skills are closely related to the quantity and variety of tools used and the sum of each participant's skills is understood to be greater than the individual skills themselves. The ability to combine skills is viewed as a great potential for tackling more complex and diverse projects. The ability to experiment with these skills and materials is central to the practice of steampunk. Often, new techniques are developed and reinvented to be applied to new materials. Aaron explains how he tried to curve brass plates to make an arm piece. He cut a U shape in a piece of wood to make two pieces, a male and female part for making a mold to curve the metal plates. In this extract of an update via email, Aaron explains how he jury rigged it since it was just a one time project:

As I feared, brass being quite "springy", it didn't remain as bended as I needed. Also, while it was easy to bend the centre of the sheet, it didn't work very well for the borders, especially for the larger pieces. Still, after letting the parts rest for a night while squeezed in the wooden shape under an anvil, they remained curved. If I had to do this kind of operation again, I would cut the wood shape into a more severe curve than I need to compensate for the fact that the brass will "unroll". But since it was a one-shot project, I supplemented this approach by wearing gloves and rolling the parts around a smaller spray can by hand. I didn't get exactly what I originally aimed for but I got something that works.

Experiments sometimes also include multiple attempts before reaching satisfaction. For example, Aaron was looking for a way to isolate already soldered wires in his communication machine the CELL. Following the suggestion of other steampunk enthusiasts on the web, he decided to experiment with melted wax (figure 6). He prepared small white candles and a larger red candle. After trying multiple combinations of candles and positions, he finally established that using the larger candle (which he thought would be cumbersome) is easy to handle and hot enough to melt once the candle is blown out.

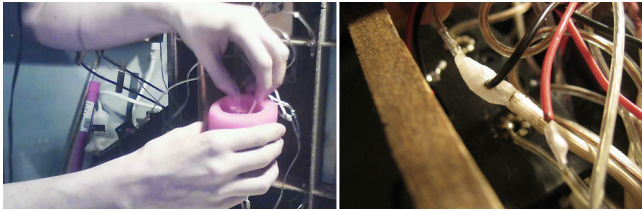


Figure 6: Experimenting with wax to isolate soldered wire.

Sharing the steampunk perspective

Finally, the perspective of participating in the steampunk community motivates all the participants. The steampunk subculture is highly active online (through blogs, Facebook pages, and websites) as well as through offline events such as annual conventions and monthly social and craft meets. Many participants created their first costume because they wanted to attend a convention. Participating in events is often augmented by the desire to promote the steampunk ideology and values. For example, a participant explains that he evolved from attendee to volunteer at the fan table and finally to sharing tips in panels at subsequent conventions. The possibility to share techniques and to inspire others is definitely an incentive for individuals to exchange with others, especially because it provides the opportunity to be inspired and learn as well.

Similarly to hobbyist jewelers, the genuine pleasure of making is also central to steampunk enthusiasts motivations and is often shared at conventions and through these online communities. For example, a participant explains that he first created a costume because he liked the look, but he concluded that the DIY approach is what motivates him to continue making projects. The contact with materials and tools is seen as both fun and challenging and the achievement of projects brings great pride to the participants. The possible outcome of having unique pieces is also a motivating element for steampunk enthusiasts. This pleasure for making also seems to be expressed to other enthusiasts and is contagious in the community.

In brief, steampunks' goals are to recreate this imaginary world of steam driven technology, where gears and other functioning parts of machines are exposed. For them, creating a character is a starting point for making future design decisions around props and costumes. Since the imaginary story around it is the most important, the

materials are not chosen based on how they will be transformed but on how they reflect the ideology of steampunk. Practitioners will develop any necessary competence to model and change any materials through experiments. In addition, the goal is to share the ideology and the techniques for making with other enthusiasts who also want to pursue their quest toward an idealized steampunk representation of the world.

DISCUSSION

Meanings as a main motivator

The main finding in this research is the importance of the meaning in the practice of non-expert designers. It radically informs the types of materials and tools used, from almost no tools for families to a wide variety of tools for steampunk enthusiasts. In both cases, the goal was not directly to make something, but the making was a means to support a more important goal (pursuing daily activities, or recreating an imagined past). However, as we described, the way this was manifested is different in each practice. Meaning often includes the foundations for further acts of appropriation. These foundations rely on implied and sometimes unspoken goals of practitioners. The best example of foundational goals is represented by our case of families, where the possibility to achieve daily activities is supported by silent and common appropriations and everyday design in the house. Foundations are also part of the practices of hobbyist jewelers and steampunk enthusiasts but the awareness of their own practices makes additional goals specific and explicit. We discuss in more details the types of goals in the following section.

In addition, we see how the choice of material also has an influence on the competences and skills that are developed by practitioners. This willingness to experiment or learn a new technique is dependent on what the ultimate goal is. We saw that for both hobbyist jewelers and steampunk enthusiasts, a part of the reason for making was the implicit pleasure of making. In this case, explorations, experimentations, and trial and error processes are welcome and become part of the strategies for making. In the case of families, experimentations are also part of the practice, through jury-rigging and ad hoc appropriations, but they are not necessarily enjoyed in a conscious manner.

Foundational, aesthetic and aspirational goals

Our analysis of the three groups indicates that meaning was the determinant element in each practice. However, our analysis also reveals that the goals can be different and we present here a classification of meanings we observed: foundational goals, aesthetic goals, and aspirational goals. We explain how each group can be a stereotypical description of each type of meaning and how this can be applied to the design of interactive technologies.

Foundational goals: families and everyday life

In contrast to the other groups, families showed that their acts of appropriation were performed in order to support other goals in their everyday routines and activities. In this

case, the appropriation or everyday design act is not the central focus of the activity, and the motivation for doing it is often embedded under a different goal. We call this type of goal a foundational or unconscious meaning for this practice. By foundational, we mean that this is not a developed goal, but that it is implied as part of actions people do without the need to think about them. Foundational goals are pillars supporting other activities in the house. They are often part of routines, unarticulated, and rarely become an activity in itself. We see in families the most striking examples of foundational goals, but we also recognize that they are a part of any practice of everyday design. Hobbyist jewelers and steampunk enthusiasts also showed instances where certain acts of design were conducted to achieve underlying goals.

Foundational goals open up a question about how to design for families or other groups of everyday designers that do not necessarily have the motivation, nor the time, to deeply engage in a practice of transforming technological artifacts. How can we make technology that can be easily appropriated on the go by families or people who just want to get by while using these artifacts? Can we make simple interactive artifacts that can be used without even thinking about it? Foundational goals would imply that some interactive technologies could be used within the flow of activities, for different purposes, as simple as a chair or a knife. Designing for foundations would also support other groups of everyday designers, who can then augment these tools with additional material to reach more specific goals.

Aesthetic goals: hobbyist jewelry aesthetic

We see in hobbyist jewelry a practice motivated by an aesthetic goal. The motivation of creating unique and personal pieces for friends and family is strong and guides all the aesthetic decisions made from the choice of material to the assemblage. We propose this type of practice, oriented by an aesthetic goal, to represent all practices that focus on a specific outcome related to the look and feel of a product.

In interactive technologies, we see the Arduino lilypad as a material that combines technological capacities and aesthetic aspects so that it can be included in fabric or paper projects. This is a great example of a material that focuses on a specific aesthetic goal of a practice and, from there, multiple projects can stem and grow in the hands of practitioners. We can reflect on how to design other materials that are used for their physical look, their texture, weight, color and shape. Is there a way for interaction designers to create tools or materials that are chosen for their beauty first?

The aesthetic goal of hobbyist jewelers is also supported by allowing some space for the materials to speak and some experimentation to happen along the way. Sometimes it is the act of discovering something new and to overcome challenges that is the reward in the act of making. Can we design tools that can support multiple skill levels of

practitioners? Tools that can grow and provide easier to harder challenges to the practitioner as he is developing his own skills? The goal would be to gradually guide practitioners to accomplish more complex and more rewarding projects.

Aspirational goals: steampunk ideology

With steampunk enthusiasts, the important literary, cultural, and philosophical current of steampunk serves as a motivation for making costumes and props. This strong ideology of steampunk is multifaceted and has implications not only in the making aspect, but also transforms how enthusiasts see the world around them. We see this group as an example of a practice guided by aspirational goals. This is characterized by an overwhelmingly powerful meaning that can motivate practitioners to overcome steep learning curves and long design processes.

Similarly to the practice of hobbyist jewelers, challenges are a part of practices that have a strong ideological goal. As challenges are overcome by hobbyists and amateurs, they push further the limits of what they thought was possible. In the digital world, arduino and new programming languages like Processing are great for amateurs who like to tinker and create as a pastime. In this case, we can see how these tools are developed for people who are willing to take up the challenge, experiment and through trial and error reach a satisfying point where a project is done. These tools would most likely be used by enthusiasts that have a strong goal or clear idea of what they want to achieve, such as steampunk enthusiasts. In that case, it would be this vision of a completed project that would encourage an enthusiast to persevere and learn this new technique. However, in some other cases, such as for families and jewelers, there would be too many barriers between the actual goal and the necessary learning time of the technique.

With these examples, we illustrate how certain tools, materials, or even competences, can work wonderfully well for some groups of everyday designers, and how it can miss by far the goals of other groups. We argue that interaction designers and researchers need to be aware of the audience, and particularly their goals and motivations for their practice of appropriation and everyday design. With this research, we can see a continuum of practices of everyday designers and makers. We value the diversity and the uniqueness of each practice and wish to see more practices evolve and develop into the realm of interactive technologies. Our discussion led us to reflect on different avenues for developing tools and materials that can support different types of practice's meanings (foundational, aesthetic and aspirational) that are appropriate for different types of users and different contexts of use. We acknowledge that these three types of goals do not reflect the complete continuum of everyday design practices, but that they are three points that reflect unique practices. We view this classification as a starting point that can further

our reflection on the different types of users, amateurs, and hobbyists.

CONCLUSION

In this paper, we presented the practices of three types of everyday designers: family members, hobbyist jewelers, and steampunk enthusiasts. We describe how the meanings of their practices have a great influence on the materials, tools and competences. From supporting daily activities, to sustaining aesthetic motivations, and to designing towards an imagined steampunk future, we revealed that each practice could hold very different motivations. Our contribution lies in providing this description, but also in reflecting on how foundational, aesthetic and aspirational goals can orient how we design to support creative practices with interactive artifacts.

For the interaction design and HCI communities, the importance of understanding the goals or motivations of the different groups of non-expert designers can be crucial in the creation of tools or materials. Interaction designers can design to support or allow everyday design and appropriation with interactive technologies as long as they know what to support. Do we design tools for experiments and multiple iterations? Do we design for simple, fast, ready at hand multiple uses of artifacts?

Future research can further explore new groups of everyday designers to add to this continuum of practices. In addition, we can start to design tools or materials that would support some of the types of motivations presented in this paper. Hopefully, this study and our reflection can nourish a design process where everyday design is championed and where personal creativity is revived to reconnect with design objects and systems.

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