

# The Significant Screwdriver: Care, Domestic Masculinity, and Interaction Design

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**HCI is increasingly recognizing its accountability to stakeholders beyond individual end users. The field now acknowledges that interaction designs participate in social formations, exerting political force whether or not designers intend them to. Inspired by the commitment to social issues common to the arts, architecture, and the humanities, we present the Significant Screwdriver, a research through design project that explicitly seeks to transgress social norms regarding the gendered division of labour in the domestic sphere in hopes of yielding insights or orientations toward improving the quality of domestic life.**

*Gender, feminist HCI, domestic care work, interaction design, research through design.*

## 1. INTRODUCTION

While interaction designs are often developed to solve particular problems, once they enter the physical world and the human social world, their actual effects can be more widespread, in both good ways and bad. From an increased focus on experience design [21], sustainability [6], and recent work on feminist HCI [1, 2], the field of HCI is increasing the scope of how we understand the stakeholders of interaction design, both in terms of breadth (i.e., the number of people affected, directly or indirectly, by designs) and depth (i.e., the range of experiential qualities now considered relevant to good user experiences).

As interaction design becomes a part of everyday life — at work, in public transit, in the home — we as a field increasingly acknowledge our need both to understand and to be *accountable* to the ways that interaction designs affect stakeholders in the broadest sense. The home, for example, entails an ecosystem that is, among other things, traditionally divided in terms of labour. In the past, women traditionally have been assigned various forms of cleaning, cooking, and care of children and the elderly, while men traditionally maintain utilities, fix broken things, and so forth. In recent decades, these traditional gender roles have begun to blur for a number of reasons, including the influence of social movements such as feminism as well as by

demographic changes involving dual wage earning households, single parent households, and so forth. Nonetheless, women's hardest domestic labour — the provision of care — remains predominantly hers. This state of affairs constitutes both a sociological issue and also design opportunities.

In [1], the notion that interaction designers can or should set aside the position of objectivity and openly disclose for whom their design advocates and in what ways is introduced as a quality of feminist HCI. Yet advocacy is complex: advocating for disadvantaged or marginalized social groups often entails at least an implicit challenge to dominant groups. Thus, interaction design that seeks to advocate can contain an element of transgression, that is, a challenge to accepted norms and structures. Transgression has long been a privileged term in art and architecture, described as “productive discomfort” [Schweder & Shelley, cited in 22] and as work that “both violates the boundaries of its audience and functions via their participation” [22]. In contrast to transgression's prominence in fine arts and design, the concept has been largely absent in HCI, with its history of “user-centered design,” a philosophy that has emphasized serving explicit and well formulated needs of an empirically understood and deliberately narrow construction of the user.

Simultaneous to the increasing scope of the field's understanding of the stakeholder has been a shift in understanding designs' relationship to knowledge production. Increasingly "research through design" has been advocated as a strategy of knowledge production [15]. This approach uses designs and design processes to help designers and design researchers develop critical understandings of design problem spaces; in other words, instead of doing research in support of design, design becomes a research methodology. In interaction design, one sees aspects of research through design arguably dating back as far as participatory design, and certainly it can also be seen in cultural probes [16, 7] and more recently interaction design theory [12, 25].

This paper presents a research through design project intended to transgress gendered divisions of labour in the home. As such, we see this as an example of feminist HCI in action. We call the design the "Significant Screwdriver" to foreground the ways personal significance of its use. The unit itself is a fairly standard cordless screwdriver/drill unit, costing approximately \$50 USD, that we have adapted with sensors and an Arduino to collect data about its use (Figure 1). This usage data in turn is used to generate aesthetically pleasing and easily shared electronic visualizations of their work as a mechanism for men to express the domestic care they enact, but seldom express, when they are working around the home.



**Figure 1:** *The Significant Screwdriver is a cordless electric screwdriver fitted with custom sensors*

As a research through design project, the Significant Screwdriver is intended to cultivate the design team's understanding of the everyday experience of domestic labour in the home and also to *challenge* that experience through design, encouraging reflection on what might be argued is a preferred state, that is, a state in which men's domestic labour is seen explicitly as an act of care and love, both by themselves and members of their families. Obviously, such a change by no means will ameliorate gendered inequalities in the

domestic sphere! The goal of design transgression is mainly to stimulate reflection and more importantly to orient people towards productive change, change that can be brought about in part through future design.

## 2. BACKGROUND

As a design, the Significant Screwdriver does not exist to solve a well formulated everyday problem. Informing this work is not an empirical study of a particular user group, but rather a body of cultural research from sociology, design history, and cultural studies. We summarize key aspects of these literatures because they are central to our (research through) design explanation. To understand how our transgression is designed, it's important to understand the domestic division of labour that we seek to transgress.

### 2.1 Gendered Domestic Labour

Domestic lives are subjectively experienced, and the "home" is more than the mere physical space; it is also a cultural construct where gender identity plays a major role. Indeed, home lives are often powerfully shaped by gender norms. In her historical analysis of the evolution of household technology, Ruth Cowan argues that "men and women were not well trained to undertake the tasks assigned to members of the opposite sex and consequently could not perform them expertly" [11]. When people of either gender attempt to maintain a household without the assistance of the other, they are likely to have to live with a lower standard of living, a phenomenon that is a frequent topic in popular culture, e.g. the comic movie *Mr. Mom*. By implication, "each household [must contain] adults of both sexes, and ... each household [must] have some minimal ability to participate in the market economy.... so as to be able to acquire and maintain its tools" [11]. Accordingly, it's not easy for people to break out of their accustomed roles.

Designs can perpetuate and even create gender roles and divisions. In an article that chronicles the roles that gender plays in the adoption and use of electricity in southern California between 1910 and 1930, James Williams [23] attributes the success of small household appliances to the alignment of then patterns of gendered division of household labour. For example, in a 1934 ad promoting electricity, men are shown reading next to lamps, while women are shown vacuuming with electric vacuums. In a similar vein, Cockburn and Ormrod [9] examine the design and the use of microwaves and conclude that domestic technological design is shaped by gender identity and assumptions, noting that early microwave ovens were targeted at women because they did the cooking.

## 2.2 Technologies, Gender and Politics

As Studies of Science and Technology (STS) research has convincingly demonstrated, technological artefacts have politics [24]. Though HCI researchers and practitioners as well as the general public often refer to technologies as tools, as if they were neutral instruments of human intention and use, we must also remember that technologies are implicated in social life: in the words of [18], “choices, creativity, knowledge, ideologies, assumptions, and values must always be explored along with the objects and machines resulting from their technological activities.” Technology becomes implicated in social life because it enters into social and institutional structures: “societies choose structures for technologies that influence how people are going to work, communicate, travel, consume, and so forth over a very long time” [24].

One of the social structures that technologies enter into is gender. As [4] writes, “Studying technological development meant studying social change, and it was obvious to us that the field of social studies of technology included the possibilities of studying changes in gender relations.” Similar arguments have been made in HCI, including [1, 8]. For example, Churchill has called for a deeper consideration of how gender stereotypes are uncritically embedded in the designs of interactive artefacts [8]. Likewise, Livingstone [20], in her study of sixteen families, notes that husbands and wives understand and describe domestic artefacts differently, especially with regard to necessity, control, functionality, and sociality, and these differences contribute to cohesion and separation in the family. Femme Den [14] has worked to establish appropriate toolkits for design products that will bring out a positive impact on women’s lives. *Female Interaction* [13] offers user-driven development methods and tools to create products that meet the demands and desires of female users, a strategy that presumably work for male users as well. These initiatives collectively highlight the need for developing design solutions that resist or transgress gender-role assumptions while connecting to users of different genders by appealing to their emotions and values as different genders relate to artifacts and technology differently.

## 2.3 Power Tools

Gendered division of labour is not simply a matter of who does what chores in the home; it also participates in gendered identity, i.e., the felt experience of masculinity or femininity in a given context, such as the contemporary Western home. Gender identity has been increasingly used as an analytical lens to examine consumers’ decision processes concerning the acquisition, collection,

and disposal of designed artefacts and technologies [11, 3, 19]. It should come as no surprise, then, that power tools participate in the construction and performance of domestic masculinity.

Looking back since the 1960s, the division of labour within the home has men disproportionately engaging in physically demanding chores within the home. While it is probably true that today’s housework cannot be said to be as strongly gendered as it was in the past [10], nonetheless between 1965 and 1995, though men performed half of the domestic labour that women did, nonetheless men performed 70% of all repairs [5]. “By avoiding ‘feminine’ tasks such as cooking, cleaning, and laundry men lay claim to a masculine self and invoke masculine privilege. Thus, women’s and men’s performance of different tasks helps to define their interpersonal relations and constructs the gender order” [10].

Given a division of labour that disproportionately places men in the “handyman” role, it is easy to see why power tools can be seen as a paradigmatic tool for men to participate in domestic activities. In his study of how men carve out space for themselves in the traditionally female domestic sphere of the home, Steven Gelber [17] points out that suburban men are able to assert themselves in the domestic environment through the use of power tools in various do-it-yourself projects. A symbol of masculinity, power tools make DIY projects enjoyable and help cultivate “the masculine legitimacy of skilled labor” in the homes and for men to retain “the aura of pre-industrial vocational masculinity” [17]. These DIY activities are money-saving, creative, and fulfilling. At the same time, household maintenance enables the suburban men “to stay at home without feeling emasculated or being subsumed into an undifferentiated entity with his wife” [17]. In other words, the evolving domestic masculinity of the twentieth and twenty-first centuries has enabled men’s contributions to domestic labour while simultaneously preserving traditional divisions between men and women, including among others the traditional male dominance of tools.

## 2.4 Transgressing Through Design

So far we have laid out arguments that (interaction) designs both reflect and perpetuate social structures. We have further argued that gender is one such structure, and in the domestic sphere, it plays out in patterned ways. The implication of all this is that if men design power tools, it is likely that constructions of masculinity will be unconsciously inscribed into the design of the tools. Indeed, we see this reflected in the rugged functionality and masculine industrial visual aesthetic of power tools

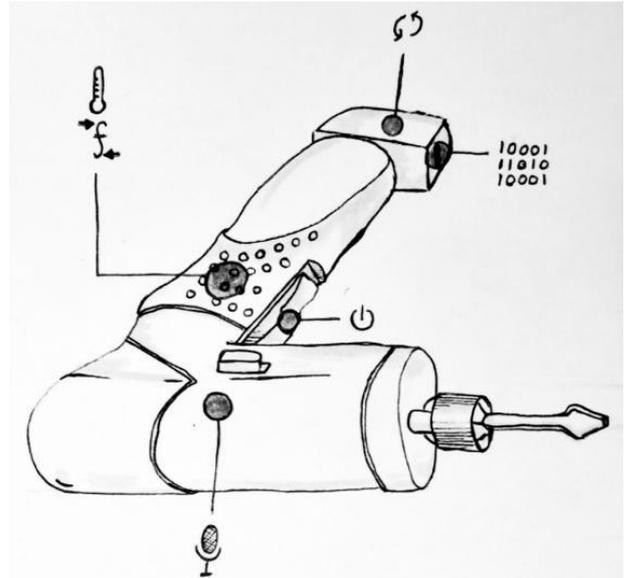
de-signed for domestic consumers. This state of affairs creates an opportunity for intervention.

An argument of that strand of feminism known as feminist standpoint theory is that the patterns of our lived experience lead to structurally different perspectives. As [1] writes, “The result [according to these theories] is that women hold and produce different types of knowledge from their male counterparts, and that these different types of knowledge should be recognized and utilized as a resource rather than marginalized.” As a gender-transgressive design strategy, then, it is possible to imagine the design of a power tool that reflects traditionally female perspectives about the relationships among labour, care, and love in the domestic sphere. The Significant Screwdriver is one such effort.

### 3. DESIGN AND PROTOTYPING

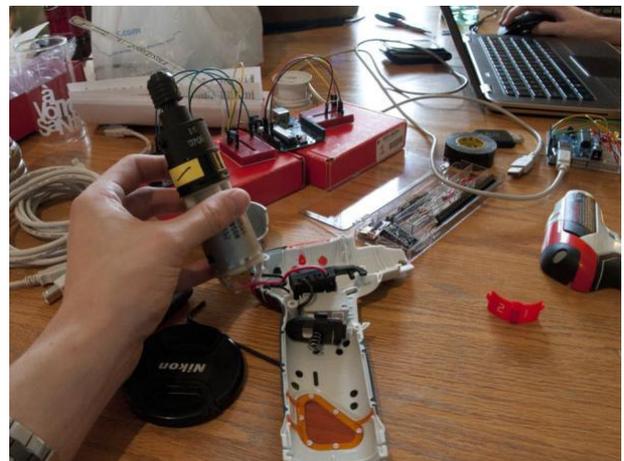
The initial concept of the Significant Screwdriver was to find a way to link the use of a power tool in an everyday way (e.g., for home repair, to assemble furniture, etc.) to the traditionally female domestic expressions of love and care. We emphasize that we believe the act of doing home repairs, assembling furniture, and so forth already is in most cases a form of care and love; at stake is that the caring and loving dimension is often implicit and unstated. Thus, the Significant Screwdriver focuses its intervention on the *explicit expression* of care and love, and not on the internal presence or absence of such care and love (whatever that might mean).

Figure 2 shows an early concept sketch of the Significant Screwdriver. To the user, it will look and function just like a normal cordless screwdriver, with the exception of a small appendage attached to the bottom of the handle, containing our physical additions. Figure 3 shows early prototyping and development of the device.



**Figure 2:** Concept sketch of the Significant Screwdriver

Our Significant Screwdriver prototype consists of an electric screwdriver and an accompanying Arduino system utilizing a range of sensors that track and record use of the tool. Each attached sensor is meant to capture a different variable of each use of the screwdriver, offering a physical account of how the screwdriver was used in a given session. This data is stored on an SD card, which is subsequently fed into a data visualization system to generate an aesthetically appealing, shareable image of a given session of the screwdriver’s use.



**Figure 3:** Early prototyping and testing of the Significant Screwdriver

#### 3.1 Building the Screwdriver

The Arduino sensors attached to the device include an accelerometer, a thermistor, a force sensor, and an electret microphone, each of which is attached externally and records data to an attached micro-SD card reader. Data from the sensors are not recorded until the force sensor, placed on the palm

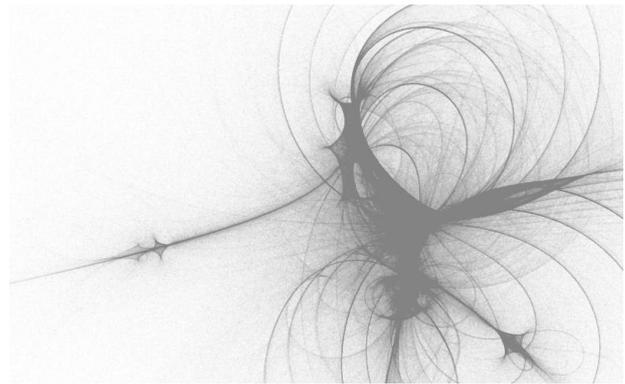
area of the grip, reads pressure input. The accelerometer is used to measure positioning and orientation of the screwdriver to identify different uses. The microphone is placed on the back of the screwdriver and was originally intended to determine the on/off state and voice volume during use. During development testing, however, we determined that it could only realistically be used to determine the on/off state of the device, but could additionally register whether the screwdriver was dropped or the user yelled. Palm temperature is measured by the thermistor to try to determine physical exertion in combination with the force sensor.

Different uses of the screwdriver should yield different results. For example, assembling a desk may require repeated use over time and longer similar uses, which can be indicated by higher recorded hand temperature and pressure on the palm. Similarly, drilling requires regular, longer, vertical use which would provide different results than removing a towel rack. Visually, it is obvious that there are sensors attached to the screwdriver, so the special nature of the screwdriver is foregrounded. What experiential effects their visibility will have will be determined during future probe studies

### 3.2. Visualizations

We intend for this screwdriver to be used on a regular basis and for data from each use session to be transferred from the SD card to a computer. We have programmed the data collection application so that it, too, can distinguish between sessions, in case users do not transfer data after each session.

The visualization application is Processing ([www.processing.org](http://www.processing.org)), a free and open source language and environment that excels with graphical representations, as shown in Figure 4. A fundamental goal is to ensure that different screwdriver work sessions, as well as different types of these sessions, have distinct visualizations, so they do not all look the same. We have programmed the visualization so that each physical variable recorded by the Arduino sensors can be mapped to a specific visual variable of the visualization. This not only gives us considerable latitude in exploring visualization styles, but more importantly it will allow end users, in a custom visual application, to interactively design visualizations based on their own use data, adding another dimension of expressivity and aesthetic control to users who want it.



**Figure 4:** An early prototype visualization using live data.

## 4. DESIGN CRITIQUES

At this stage, we have a fully functioning prototype, including several working Significant Screwdriver units as well as a functioning visualization interface. As a strongly conceptual design probe, we were eager for critical feedback. To obtain it, we conducted a series of design critique sessions with a total of 6 male interaction design Master's program. Each was provided with background information, a high-level overview of our design objectives, as well as the working Significant Screwdriver itself, along with some wood, screws, and other materials to work with. Each was asked to comment freely and brainstorm how a tool like this could be used. The resulting design critiques can be broadly characterized in terms of the following four themes:

- *Form and Function.* Participating designers noted that drilling with the Significant Screwdriver is fun and relaxing. They indicated that it is not too heavy and felt natural. Some associated the tool with gender, noting that the lightness and compact size of the tool makes it feel "not too manly." Its weight also had functional connotations, conveying a sense of its commercial value and expected reliability. A couple participants noted that a lighter screwdriver might have felt cheap and undermined the intended experience.
- *Awareness and Anticipation.* Like any other tool, the Significant Screwdriver defines, organizes, and constrains users' behaviours and makes them sensitive to certain aspects of the work process. Knowing its purpose, however, foregrounded certain kinds of cognition during the process: the designers indicated that they began to anticipate the reactions of the loved ones who would use the artefacts. Interestingly, this heightened awareness of loved ones also encouraged a commitment to craftsmanship, as cutting

corners was evaluated in socio-emotional, rather than functional-economic terms. The Significant Screwdriver also was said to create new needs, specifically an emotional need for the labour to be appreciated. After playing with the visualization interface, the designers indicated their expectation that it would convey help them express the extent of their labour. It was likewise seen as ludic — something to play with — in addition to its contribution to social bonds.

- *Ecology of Artefacts.* Projecting the Significant Screwdriver into their own everyday lives, the designers noted that many maintenance tasks around the house are small and do not always involve power tools. They wondered if limiting the interaction to a single tool, rather than a collection of tools, small and big, might undermine some of the efficacy of the intended intervention.
- *Context of Use.* The designers were curious about our decision to abstractly represent the data, without actually providing it in a straightforward way. For instance, though our data indicates how long the tool was in use, this information is not readily visible to the user or his loved ones in our visualizations. Some indicated that they might find the visibility of such information helpful in expressing the extent of the labour and building appreciation for it. These comments made us more sensitive to the intrinsic tension between the visualization as an aesthetically pleasing work versus as an information representation. Additionally, participants inquired about the different meanings the tool would have given different residential situations, e.g. a father of a traditional nuclear family as opposed to young people, such as college students, living together, or someone living alone who works on a project for a loved one living elsewhere.

The design critiques helped us anticipate ways that users might interpret the Significant Screwdriver. In addition to helping the design team think through certain aspects of the problem domain that had been hidden, the critiques also are helping us design the probe study that is the next phase of this work.

## 5. CONCLUSION

As research through design gains traction in the HCI community, we might ask what kind of research design is positioned to facilitate. Empirical social science is often directed at what-is, typically seeking to represent the present or near-past. Yet

design is interventional, that is, more oriented toward changing aspects of our lifeworlds than it is toward representing them. It seems that research through design, then, likewise might favour intervening upon, rather than representing, reality. To a certain extent research through design is a natural ally to transgressive ways of thinking, as much of the arts and humanities are likewise committed to social change through transgression. The change likely to be effected by the Significant Screwdriver surely will not be a transformation of domestic labour, but rather contributing towards a thoughtful and hopefully productive orientation towards such a transformation, which might, for example, help interaction designers be more accountable to design stakeholders in the broadest and deepest senses of the term.

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