

Steampunk as Design Fiction

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ABSTRACT

In this paper we look at the Steampunk movement and consider its relevance as a design strategy for HCI and interaction design. Based on a study of online practices of Steampunk, we consider how, as a design fiction, Steampunk provides an explicit model for how to physically realize an ideological and imagined world through design practice. We contend that the practices of DIY and appropriation that are evident in Steampunk design provide a useful set of design strategies and implications for HCI.

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Design Strategies, Steampunk, Design Fiction, DIY, Appropriation

ACM Classification Keywords

H.5.2 [Information Systems]: User Interfaces - input devices and strategies;

General Terms

Theory, Design

INTRODUCTION

The literary genre and subculture of “Steampunk” may hold interesting and new perspectives for HCI and interaction design. In this paper we will consider how Steampunk may be understood as a design movement, by examining how Steampunk practitioners document and disseminate their techniques and methods through online DIY tutorials and personal design blogs. We argue that the practices of Steampunk makers represent a unique convergence of several concepts that are of particular relevance to HCI and interaction design: namely the concept of *design fictions*, and the interrelated concepts of *DIY* and *appropriation*.

Steampunk is a multifaceted phenomenon that manifests as a subcultural identity, as a community of practice rooted in design and making, and as a fictional representation across a wide range of media forms. All of these are bound together by a shared ideological and aesthetic sensibility that re-envision modern day technology through the lens of a fantastic and idealized vision of the Victorian Era. In

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Steampunk speculative imaginings and its material practices are inextricably linked to each other. Based on a study of online practices of Steampunk, we consider how, as a design fiction, Steampunk provides an explicit model for how to physically realize an ideological and imagined world through design practice. We contend that the practices of DIY and appropriation that are evident in Steampunk design provide a useful set of design strategies and implications for HCI.

In this paper we broadly define Steampunk and describe key concepts we used to frame this study, *design fictions*, *DIY* and *appropriation*. We describe our study of the online presence of three Steampunk “designers” and two aggregate web sites, and discuss implications.

WHAT IS STEAMPUNK?

Steampunk is a subgenre of science fiction literature that traces its roots back to the early science fiction of Jules Verne and H.G. Wells [22]. The most common expression of Steampunk involves imagining a world in which steam power rather than the internal combustion engine became the dominant form of energy. Typically, Steampunk fiction and design evokes an alternate history that wedds aspects of the modern day, such as computation, to elements of Victorian aesthetics, materials and culture. The name “Steampunk” appears to have been coined in 1987 by author K.W. Jeter, to describe the revisionist histories of himself, Tim Powers, and James Blaylock [48].

Since the coining of the term, Steampunk has experienced a steady growth within popular culture, transforming from a fringe genre to a fictional form of broad mass-market appeal with examples in literature film, graphic novels, and computer games. The canonical contemporary work of Steampunk fiction is *The Difference Engine*, a speculative history written by Bruce Sterling and William Gibson [21] in which Charles Babbage’s “analytical engine” ushers in an era of mechanical computation at the start of the industrial revolution.

In comics, Alan Moore’s *The League of Extraordinary Gentlemen* draws heavily on Victorian literature to envision an alternate history where Captain Nemo, Alan Quatermain, Dr. Jeckel (and Mr. Hyde), the Invisible Man, Mina Harker, and Dorian Gray team up to fight threats to the British Empire [35]. In film, Barry Sonnenfeld’s *Wild Wild West* represents one of the first mass media appearances of the

Steampunk aesthetic, with its giant steam powered machinery [42].

The rise in popularity of the Steampunk aesthetic has also given birth to a subculture movement of self-identified “Steampunks”. Although still a young movement when compared to other subculture groups, such as Punk [33], the Steampunk community already has many avenues of cultural expression including international Steampunk conventions, Steampunk musical acts, local Steampunk hobby organizations, and even touring Steampunk circuses [47; 49-51]. One of the key defining characteristics of Steampunk, however, is that it is built around physical artifacts that evoke an imagined alternate past, present and future. This paper focuses this aspect of the Steampunk movement as most relevant to HCI.

KEY CONCEPTS

In our paper we explore three main concepts: design fiction, DIY, and appropriation, which we outline here.

Design Fiction

The notion of *design fiction* is still taking shape in the discourse of HCI and design research [14; 40; 43]. Although its origins are unclear, the earliest use of the term appears to be in a presentation given by Julian Bleecker at the *Engage Design* conference in 2008 [5]. Bleecker’s talk was given in response to an unpublished paper by Paul Dourish and Genevieve Bell entitled *Resistance is Futile: Reading Science Fiction Alongside Ubiquitous Computing* [13]. In this article, the authors perform parallel analyses of design trends in science fiction television during the period from 1963 to 1989 and developments in ubiquitous computing in the 1980s. Science fiction plays a significant role in shaping the general public’s understanding of science fact.

David Kirby uses the term *diegetic prototypes* to “account for the ways in which cinematic depictions of future technologies demonstrate to large public audiences a technology’s need, viability and benevolence” [29]. Both Kirby and Bleecker provide the gestural interface from the film *Minority Report* as an example of a fictional realization of a technology that went on to broadly inform public opinion (and design practice) about interactive technologies. A more recent work by Bleecker explores how actual design and science as practices intersect with the imagined futures of science fiction narratives [4]. In a recent ACM *interactions* article entitled *Design Fiction*, science fiction author and futurist Bruce Sterling considers how a design perspective can be used to inform the creation of fiction that better engages with the issues of an imagined or desired future [43].

In interaction design, Dunne and Raby’s [14] *speculative design* and *design noir* are good examples of design fictions as a strategy for exploring interactive technologies, similar to Gaver’s *ludic design* [18]. Svanaes and Verplank’s exploration of potential metaphors for the design of TUIs

advises designers to adopt metaphors from magic and paranormal phenomena, the staples of fantasy literature [44].

DIY (Do-It-Yourself)

Kuznetsov and Paulos view DIY practitioners as “expert amateurs” who create, modify or repair objects without the help of paid professionals [30]. The notion of the “expert amateur” reflects the fact that the skills involved in DIY are often quite advanced and grow continually in practice. Further, it reflects the fact that the culture of DIY is based on “anticonsumerism, rebelliousness, and creativity... supporting the ideology that people can create rather than buy...” [30]. We see this manifest in a practice of *bricolage* in Steampunk design [31]. Typically with DIY, the techniques used are shared for others to duplicate or improve upon within an open source model. For example, web sites like Make Magazine (makeprojects.com) and Instructables (instructables.com) are online communities that include how-to resources, blogs, and web forums. Early DIY practices emerged from hacker cultures and were thus influenced by a computing ethos, programming/hacking and open source [17].

Appropriation

Appropriation is related to DIY. Appropriation can be described as the use of a designed artifact for a purpose different than intended by the designer(s). We have researched customization and appropriation under the concept of *everyday design*, where we examine the possibility that everyone is a designer and that design occurs on an everyday basis through use or design-in-use (modifying during the experience of using artifacts or systems) [55-56]. This work is related to other investigations of appropriation [7; 11-12; 25; 45], interpretation [41] and ambiguity [8; 18] in interaction design. Similar to our study, Akah and Bardzell conducted a study of Steampunk culture to investigate personal appropriation [1]. Their insights focus on a guideline for how designers can support identity construction by allowing users to transform artifacts to both suit and represent individuals through altered functions, interactions, and aesthetics. Our work extends the idea of individual appropriation by investigating the social and creative practices of Steampunk as a design strategy. Similarly, we extend the idea of identity construction in wider social terms as the manifestation of a subculture that is seen in terms of design as design fiction.

Appropriation has been identified as central and inevitable in the use-life of design artifacts and systems. Researchers have discussed the need for technologies to support appropriation. For example, Mackay and Gillespie [32] argued that the design processes of conception, invention, development and design require the inclusion of social appropriation in order to fully understand designs and technologies. Henderson and Kyng [24] argued for the need to *tailor* a workplace system and allow for *design-in-use*

which refers to ongoing design of systems by end-users in order to adapt systems to their particular needs. HCI and computer supported cooperative work theories have emerged, such as Instrumental Genesis [3] that identifies appropriation as part of the human developmental process in transforming designed tools into instruments of use; and Adaptive Structuration Theory [10] that sees appropriation in social terms as the internalization of perceived technical and social structures that influence future actions, i.e. appropriation is a way of incorporating technology into individual or group work practices. We see these key concepts as the bridge between the phenomenon of Steampunk and HCI. These concepts helped frame the data collection and analysis of our study.

OUR STUDY AND METHODS

There are several facets of Steampunk that make it useful as a way of thinking about HCI and interaction design. To identify the core elements of Steampunk design practice, we undertook an analysis of the material available online to support Steampunk designers. We looked at the online presence of three individuals engaged in Steampunk making: Richard Nagy of the Datamancer site [36], Jake von Slatt of the Steampunk Workshop site [54], and Sarah Brumfield from the Steampunk Home blog [6]. We also looked at two aggregate Steampunk sites with how-to/projects sections: Brass Goggles [52] and Aether Emporium [51]. These individuals and sites were selected due to their prominence within the online Steampunk community. The study is also informed by our own (two of the three authors) involvement in Steampunk. Using evidence from these resources, we examine how Steampunk artifacts are made in terms of the materials, practices, and motivations underlying the design process.

The work presented herein represents a mix of qualitative and ethnographic data collection approaches, drawing evidence primarily from online documentary materials produced by participants and practitioners of Steampunk. Williams and Irani provide several useful examples of how ethnographic methodologies may be employed in HCI, arguing that improvisational ethnographic methods provide researchers with the means to study social practices and appropriation of technology *in situ* [57]. Some recent examples of this approach include Rosner and Ryokai's study of crafting cultures among knitters to inform an understanding of technological appropriation [38] and Dantec's study of technology use among the homeless [9].

HOW IS STEAMPUNK DESIGN?

While Steampunk has its roots in literature, we believe that its growth as a genre and subculture has owed as much to the crafting practices of DIY and making as it does to its manifestations in popular fiction, comics, film, and games. In *The Journal of Neo-Victorian Studies*, Onion writes:

“Steampunk culture is perhaps most defined by the object-based work of its fans. Many fan interactions



Figure 1. Two well-known Steampunk artifacts: The Steampunk Laptop by Richard Nagy, aka "Datamancer" (left) [36] and author G. D. Falksen, wearing a Steampunk-styled arm prosthesis by Thomas Willeford (right) [16]

are founded on the creation of these objects...Technology and design, in addition to textual expression, are integral to the community of those dedicated to the steampunk aesthetic, and form the basis for many of its most profound statements on the nature of human interaction with craft and production.” [37]

To understand Steampunk it is crucial to understand these practices of making. Steampunk is characterized by a set of anachronistic material obsessions: leather, wood, brass, wax, glass, canvas, and other early industrial revolution materials give Steampunk design a patina of historicity. As the name suggests, Steampunk design celebrates an imagined era of “mechanical high-tech” that is populated by steam engines and clockwork automatons. As we will discuss in greater detail below, Steampunks are often not satisfied to simply consume these media, but instead express their engagement in the culture through practices of DIY and appropriation.

Making/Artifact Driven

Within the realm of potential design fictions Steampunk is unique because it is rooted in the practice of making things. The central idea of the genre is best expressed via specific, iconic artifacts (see figure 1).

Objects

Most of these pieces are created largely as an exercise in seeing what is possible; they are mixture of art pieces and functional objects including case mods such as the Steampunk Laptop (figure 1) and Steampunk xBox (figure 2). Costume pieces and props are also common, such as the prosthetic arm (figure 1) and raygun (figure 2).

While the costume pieces are generally intended to be worn in public to conventions, Steampunk gatherings, or on Halloween, the overt “purpose” of the case mods and some of the other pieces is more subtle. Frequently they are undertaken simply to enrich the maker's own private life, so that rather than having a generic laptop or Xbox, they can take pleasure in their own unique, handmade creations. However, the pleasures inherent in creating a detailed Steampunk object are not purely private even for those



Figure 2. Steampunk Xbox Mod (left) and Steampunk Raygun (right) by the authors

objects that never leave the maker's house. Pictures and descriptions of the pieces are typically posted online for the appreciation of the Steampunk community. The impetus for a specific project typically grows out of a desire to try a new technique, use a particularly interesting found object, or to address some minor need. Jake von Slatt describes how the project to build a Steampunk-style lamp came to be:

"We have a new puppy in the house, and while this is a wonderful thing in general, it means I sometimes have to get up in the middle of the night to let him out. The problem is I don't have a bedside lamp so I end up stumbling across the bedroom to turn on the overhead lamp so I can find the leash as well as my robe and shoes...So, my next project had to be a new bedside lamp. Like most of my lamp projects this one started with a visit to the junk bins. At right you see part of an antique student lamp I rescued from the metal recycling bin before the ban on picking at our local dump went into effect. It's quite nicely made, but this is all I was able to retrieve." [54]

Materials

On a superficial level, Steampunk can be identified by the application of gears and antiqued brass accents to objects and clothing. There certainly is a core look to the Steampunk aesthetic that comes from a commonly shared set of materials that reference earlier times: wood, brass, copper, and leather. When plastic is used, it is typically treated or painted in such a way as to mimic wood or metal. One of the ways that the Steampunk aesthetic comes to be shared across the practitioners is in the sharing of inspiration images.

All of the online resources we studied included posts and links to commercially available items that fit with the Steampunk aesthetic or to other people's projects that the poster found inspiring. Occasionally these posts would spark some debate about whether or not an object fit within the mandate (design fiction) of Steampunk, either because of historical anachronisms or other modern touches that took away from the appropriateness of the work. This continual negotiation of what does and does not fall within the purview of the term Steampunk is one of the ways the community knits itself together and establishes a shared set of values and practices.

Another common material practice in Steampunk is the reuse or revivification of old, soon-to-be discarded objects.



Figure 3. Lyra's Lamp (right) and starting pieces (left) by Jake von Slatt from the Steampunk Workshop [54]



Figure 4. Shared inspiration images of pieces and full looks

Sara Brumfield from the blog *The Steampunk House* characterizes her Steampunk-inflected home renovation work as follows:

"I believe that Steampunk is more than just brass and watchparts. It's finding a way to combine the past and the future in an aesthetic pleasing yet still punkish way. It's living a life that looks old-fashioned, yet speaks to the future. It's taking the detritus of our modern technological society and remaking it into useful things" [6].

Project descriptions frequently begin with a description of how the designer stumbled upon the perfect piece in an antique store or junk yard. The biggest link section in Aether Emporium's "How To" page is labeled "Supplies and Yards", containing pointers to places like reclamation and salvage yards, glue and epoxy stores and specialty bottle suppliers [51]. Another common starting point is taking apart something modern, such as an LCD monitor, to see if removing the case can expose more appropriate materials for fitting the Steampunk aesthetic [54].

Techniques

The most detailed, step-by-step tutorials posted are for specific techniques, such as etching metal using salt water and electricity [54]. Some makers now also offer DIY kits that can help jumpstart other people's projects. In particular, items that require specialized equipment to make, such as etching circuit boards or cutting and polishing metal, are sold as parts by makers who have such equipment [36; 54]. The second largest section on Aether Emporium is "Faux Painting and Weathering Methods" with links like "Aging fabric with tea" and "Simulated wood grain for metal boxes" [51]. These techniques are used to age modern materials, of course, but are sometimes also applied to authentic antiques. Talking about making the lamp seen in figure 3, Jake von Slatt describes why this might be so:

"After assembly I cleaned and polished the lamp. It polished up very nicely, too nicely. It's interesting how modern manufacturing methods have made high quality finishes look cheap. If you polish a piece of wood or metal too much it begins to look to us like a fake piece of wood or metal made from plastic. I decided this would be a good opportunity to try the ammonia method for aging brass..." [54]

A second common class of techniques relates to attaching things together. Because projects are typically made out of an assortment of parts put together in new, unexpected ways, a solid command of adhesives and techniques for firmly affixing components to a base is required. In the Steampunk raygun seen in figure 2, the base of the gun is a child's plastic nerf gun, spray painted to look metal. The circular elements above the grip and at the end of the barrel, as well as the tall cylindrical piece at the top back of the gun all come from a disassembled antique hair dryer and are authentically metallic. Glue holds some of the pieces in place, while others are screwed into the plastic base.

Practice

The practice of Steampunk design is frequently documented on maker blogs or forums [36; 52; 54]. The most common form this takes is a "walkthrough": a series of pictures taken throughout the design process, interleaved with descriptive text on what was done and links to resources for achieving similar results. Since so many projects are based on unique, one-off finds from antique stores, direct replication of a project will be difficult or impossible. Therefore, the focus of documented design process is typically on specific methods and techniques that can be applied more generically, rather than on a step-by-step demonstration of what exactly was done for this particular piece. Motivation and context are provided for most of the steps taken; rather than saying "do x and then do y", the process is described more in terms of "because x and y were true, I did z". This allows people planning to use the same technique to be able to assess whether or not it would be appropriate for their project.

Here is an example of a well-documented design process, from the Steampunk Workshop [54]. The project begins with von Slatt noting that, having made a Steampunk styled keyboard, his LCD monitor now clashes with it (see figure 8 for the keyboard).

The first step taken is to remove the plastic back of the monitor, revealing the steel interior (figure 5). After briefly considering making an entire new case out of brass, von Slatt decides to simply spray paint the silvery metal instead (figure 6). He then discusses the antique gas lamp arms that he purchased online, saying "It was, in fact, these arms that inspired this project. As soon as I opened the box they came in I knew instantly what I was going to do with them." [54] (figure 6, left bottom)

A front facing for the monitor is constructed out of spray

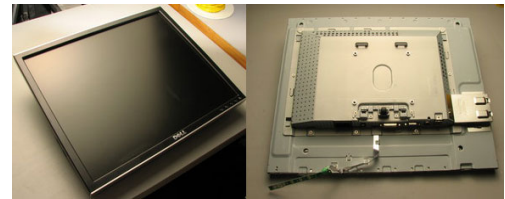


Figure 5. Starting stages: the original monitor (left), and with case removed (right)

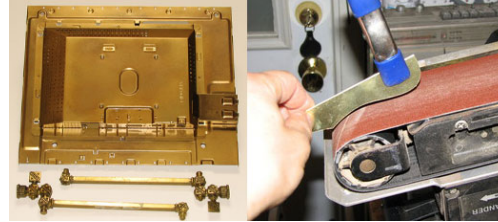


Figure 6. Monitor Frame Construction: Spray painted chassis (left) and sanding brass trim (right)

painted aluminum from the hardware store, which is then deemed insufficiently ornate, so von Slatt machines some brass trim pieces (figure 5, right, and figure 6, right). To create a marble-look base, von Slatt finds a marble graphic online and prints it on several sheets of paper. These are then decoupage onto a piece of wood (figure 7).

Finally, a way must be found to gain access to the monitor buttons despite the decorative frame (figure 8). Von Slatt describes his thought process: "I was going to make a little brass box for the buttons but I went through the box of parts from a grand father clock escapement that I pulled out of the metal recycling dumpster at the town's transfer station and I thought the chime levers would make great controls." [54] When the entire piece is finished, it is situated next to the Steampunk keyboard that inspired the work (figure 8).

Motivation

In addition to a unified material aesthetic and a community-oriented sharing of process, Steampunk design is brought together by a set of shared motivations for design. Steampunk can be seen as a reaction against mass production and industrialization, possibly even a form of post industrialization. The world envisioned by Steampunk returns to the golden age of technology at the cusp of the industrial revolution, but infuses it with modern computation, craftsmanship and personal effort. Richard Nagy says:

"The home computer was denied what I feel to be the proudest time in the life of any technological device. It was robbed of the fleeting, wonderful period right after invention, where it is celebrated and honored by the finest craftsman and creative minds, and given a structure befitting its potential and greatness...When the steam train roared into history...it was an awesome beast, adorned in the finest woods, ivory, gold, and intricate inlays...The television and radio affected the world in more ways that can be imagined...They were both appropriately gifted with the most lavish of hand tooled, wooden scrolled cabinetry, housings which



Figure 7. Monitor Base Construction: Mod Podge to affix marble pattern paper (left) and the finished base (right)



Figure 8. Finishing Touches: Disguising the monitor buttons (left) and the completed project (right)

borrowed architectural details from the grandest schools, churches and banks. Sadly, the personal computer... never received the same kind treatment. It went from a buzzing beige cube, to a buzzing white one, to the garish space-eggs you see nowadays... What I'm trying to do is retroactively create a false period of greatness in computing. The "Golden Days" of the PC, so to speak." [36]

Jake Von Slatt describes Steampunk thus:

"To me, Steampunk is the Personal Industrial Revolution.... The death of Newtonian physics in the early 20th Century begun a time where we encountered concepts in our daily lives or read about things in the news that we did not have the tools to fully comprehend. Somehow, this became acceptable to most people and the trend not only continues, it accelerates. Steampunk, I think, is a reaction to that. One can imagine the steps required to make a steam engine from iron ore, coal and fire. But a silicon chip from beach sand? Sequence DNA? The mind boggles! Now, take a look at some of the old copies of Popular Mechanics you can find on the net. You'll see that the projects within are pretty state-of-the-art for the times in which they were published. For a long time that sort of project was missing from the "Popular" mags. In fact, many of the "Popular" mags pretty much disappeared from the news stand and were replaced by computer magazines. The "Punk" side is the refusal to be limited and is exemplified by the likes of Make: magazine, Instructables, and Hack-a-day. The Personal Industrial Revolution is when, if you don't like your cellphone, MP3 player, car, or bicycle, you make one you do like." [53]

DISCUSSION

Design Fiction in Steampunk

Envisioning, scenarios, and future workshops are integral

techniques in design: each employ fictitious futures in order to explore design ideas. However, these approaches engage in a limited narrative restricted to a situation or event, centered on a set of technical functions or singular experience. Design fiction in Steampunk is a sustained envisioning that forms a narrative logic that governs the cultural values and meanings in which design is generated and imagined.

Design fiction is of an ecological scale and complexity beyond current design techniques. A design fiction constructs imaginative fictional *realities*, amplifying and extending the logic of the narrative. In Steampunk, it is a narrative in which the active construction and representation of the fiction inform each other constantly and can be used to explore the implications of *actual* new design ideas on an imagined human society. Dourish and Bell point out that there is already an unavoidable dialogue between science fiction visions of the future in the popular culture and the actual design of technology [13]. Bleecker takes this notion one step further by arguing that practices in design research and HCI, particularly in the field of ubiquitous computing, can be viewed as existing on a continuum between science "fact" and "fiction" by engaging with a highly speculative vision of computing rather than a pragmatic one [4].

We venture even further to argue that design fictions such as Steampunk explore alternate models of values and meanings. The Steampunk model constructs new notions of craftsmanship, functionality, and aesthetics. Intentionally or not, this alternate social reality serves up a critique of our own norms and values. In Steampunk, the power of design fiction goes beyond aesthetics and style. The narrative logic extends to the point of having a strong sense of its own fictional future or ideal. For example, in our study the role of inspiration images and objects are aspirational. Steampunk designers found representations of future ideals to design toward. At the same time, these ideals are open for community debate on what is acceptable within the shared design narrative of Steampunk. The importance of this point is not the exact aspirational object or image, but rather the underlying articulation of values, meanings and goals embodied in one choice or another. The design fiction is made explicit and is a matter of active and collaborative social construction.

Steampunk design fictions make it clear that objects are ultimately social. Richard Nagy's lament for the lack of "Golden Days" design in computing is a good example of this. He argues for the need to "retroactively create a false period of greatness in computing" [36] where craftsmanship is on celebratory display as evidence of the technical and creative milestones it has achieved. Craftsmanship is clearly an element of computing, as the manufacturing, design and technologies involved are at a level unseen before. However, unseen is how it mostly remains in the context of computing as a social object. Its craftsmanship is hidden at a microscopic and electronic level that is invisible to the

unaided human eye. The once beige and now universally silver and black boxes of today's personal computing are almost comical in their understatedness and desire to not be seen! In the *reality* of the Steampunk design fiction, computing needs to be rescued from the invisibility of technical efficiency and functionality. And this is accomplished through a social and cultural language of craftsmanship that is not only evident but also celebratory.

Design fictions are discursive and diverse. In HCI there is critical interest in the social context of a technical system yet little research into how the technical system itself is a social object. Design fiction shows the “sociality” of an object, in other words its social qualities and expression. That craftsmanship in Steampunk is *symbolically* expressed in the design of the object is an important cultural and social statement. Design fictions actually help to propel the designs of Steampunk and other subcultures forward by setting cultural and social meaning as design goals – aims that are constantly in flux and under active construction. Additionally for HCI, design fictions show that different groups hold different values. Allowing active and explicit construction of the meaning of technical objects through the design fictions of cultural groups creates a needed diversity in the social expression and social meaning of technical objects.

DIY and appropriation in Steampunk

As we discussed, design fictions motivate and guide the intellectual reality of Steampunk, yet it is DIY and appropriation that facilitate the making and modifying of the physical reality of Steampunk. Steampunk as a design movement is reliant on DIY and appropriation for practices and techniques. As designers, like DIY practitioners or everyday designers who appropriate [55], Steampunk practitioners are *bricoleurs*.

Panagiotas Louridas first made the connection between Lévi-Strauss's anthropological concept of a *bricoleur* with design [31]. A *bricoleur* is someone who makes do with what is available or encountered in a specific situation. The *bricoleur* operates from the available means (the concrete tools and materials offered by a specific situation) but treats them as signs, by seeking to determine and redefine the roles they can play in a given situation. *Bricoleurs* are not bound by general and accepted practices or the logic of abstraction like professional practices such as engineering or medicine. Rather, the designer as *bricoleur* deals with the concrete material before her or him, and relies on past experiences and immediate discoveries. A *bricoleur* is heterogeneous in sensibility, interrogating a situation from within and from multiple perspectives with whatever means the situation affords. In Steampunk, this no-rules approach is further fueled by the aims of the design fiction and a strong dose of punk attitude [53].

End-user customization of digital and software systems has been an ongoing concern in the development, design, and studies of use of interactive systems by researchers and

practitioners in HCI (e.g. [15; 39]). End-user modifications, whether for extensibility, customization, or personalization, have been pursued through a number of approaches by end-users, however often in conflict with the design of artifacts and systems. For technology designers, modular design has been the mainstay approach to support end-user and designer changes [2; 46]. Modular design is very powerful but it has its limits with respect to customization. Modularity does not typically operate at the user level, making potential changes opaque to end-users. It also heavily relies on explicit interoperable infrastructure, standards, and specialized skills – making it a top-down design strategy [2]. Emerging practices like Steampunk through DIY, and appropriation challenge these assumptions in design.

In Steampunk, design and making often begins with a “visit to the junk bins” [53] where an existing artifact or object can be appropriated. As we can see, appropriation begins the design process in Steampunk. This makes sense in what are often “case mods” like the Steampunk laptop (figure 1) and the Steampunk Xbox (figure 2). Yet the modifications can become quite extreme and alter the intended functionality of the original object like the Steampunk Raygun (figure 2) or especially Thomas Willeford's arm prosthesis (figure 1). In addition to altering the intent of original designs, and further in keeping with appropriation, the results are highly unique or one-offs [55]. The aim is not mass production or scale – it is particular and singular.

The heterogeneity of the *bricoleur* designer or DIY practitioner is evident in the techniques of Steampunk. Among them is the key use of adhesives and other methods of attachment. Eschewing modularity or plainly ignoring it, Steampunk designers use glue and other adhesives to join and attach irregular and heterogeneous parts. Like many DIY practitioners, the inventiveness of technique lies in working around the necessity of the standard interface of modular design that joins and connects predesigned components. Even more focus is given to techniques of weathering, aging, and simulated wood and metal finishes. The finishes serve the aesthetics and appearance of the design fiction of Steampunk but they also provide the appearance of a coherent and well designed object that under the surface is made of heterogeneous materials glued and affixed together. In modularity, the seamlessness of an object is achieved through the fit of tool and die machinery or computer-aided manufacturing; in Steampunk the quality of fit is replaced by the representation of finish. The *look* of the materials and craftsmanship is what is important, not the actualities. These signs maintain the design fiction but more importantly they allow the Steampunk designer to do it themselves adhering to both a *bricoleur* and punk sensibility that can never be designed into a modular platform.

In Steampunk, DIY and appropriation both physically form and conceptually inform the design fiction – they offer a practice for the making or the design of the reality of

Steampunk. DIY and appropriation techniques can be seen to be encouraging creativity, resourcefulness, and participation in the use and re-use of digital artifacts. In Steampunk, we can see how DIY and appropriation techniques are alternatives to modular design as a means to customization and modification. In fact modular design and other system design approaches that are the backbone of technical design are *anti-bricoleur*, anti-tinkerer, and anti-DIY. The standardized and specialized skills of production make end-user participation in its making limited. Not so ironically, Steampunk internalizes this opposition to modern day design and industrialization techniques by making opposition to them central to the design fiction.

Participatory Cultures: Subcultures, Fandom & Design

Von Slatt lamented how magazines like *Popular Mechanics* “disappeared from the newsstand and were replaced by computer magazines” [53]. The challenge for HCI is that any foreclosure on a wider participation in the making and meaning of technical objects limits its own ability to be more diverse, inventive and creative. To avoid institutionalizing these creative practices, we suggest a consideration of vernacular cultures of fandom as a rich source of new design innovations.

The discursiveness and social construction of design fictions together with DIY and appropriation embeds Steampunk within a subculture and fan community of making and design. Subcultures, communities of practice, and fandom have long been the subject of study in the humanities and social sciences, so much so that an exhaustive review of the literature lies outside the scope of this paper¹. Of relevance to this paper is the work of Henry Jenkins on fandom and participatory culture, which traces the arc of fan culture from a marginalized and ridiculed minority [26] to a movement of cultural producers whose participation is central to the operation and creation of present day culture [27-28].

The cultural production that arises out of the practices of fan communities takes a wide range of forms including the creation of new narratives in favorite storyworlds (“fan-fic” or “slashfic”), role-playing and reenactment of favorite genres and stories, costume and prop creation (“cos-play”), original artistic creations (fan-art), composition of music about or for a favorite narrative (“filk”), and even incorporating fandom practices into daily life and domestic design.² In many cases, this cultural production extends far beyond simple “appreciation” and reproduction of existing media forms and into the design of new cultural artifacts.

¹ As a starting point, see Ken Gelder’s *The Subcultures Reader* [19].

² See, for example, the case of the *Star Trek* fan who is converting his home into a *Star Trek*-style “starship command center” [34] or the couple building themselves a Tolkien inspired “Hobbit Hole” home [23].

The participatory culture of Steampunk creates a different type of cultural producer who sees design and technology as discursive, diverse in meaning and values, and bound less by common rules and more by common discoveries of practice.

Steampunk as Ideology

As a literary genre, subculture, and *bricolage* practice, Steampunk is partially a reaction against the dystopian visions of the future that were popular in the Cyberpunk literature that was ascendant when the term was coined in the 1980s [20]. Steampunk reflects a unique type of technoutopianism that embraces the freedom that comes from having personal agency over technology. Onion describes Steampunk ideology as follows:

“The steampunk ideology prizes brass, copper, wood, leather, and papier-mâché – the construction materials of this bygone time. Steampunks fetishise cogs, springs, sprockets, wheels, and hydraulic motion. They love the sight of the clouds of steam that arise during the operation of steam-powered technology. Many of the people who participate in this subculture see reading, constructing, and writing about steam technology as a highly libratory counterculture practice (hence, the addition of the word “punk”). How did these technologies, once so reviled, enter back into the cultural lexicon as icons of a new utopian landscape?” [37]

This is one of the core contradictions that underlies the ideology of Steampunk; although the genre celebrates an era in which mass production and assembly were coming of age, it resists traditional narratives of industrialization that prize uniformity and homogeneity. The personality archetypes that best characterize Steampunk as an identity are the tinkerer, the inventor and the *bricoleur* — individuals exercising agency over their world through technological intervention. The other contradiction that lies at the heart of Steampunk is its celebration of individual liberty, egalitarianism, and gender equality, even as it draws inspiration from a historical era in which an oppressive class system still dominated society. It is in these contradictions that Steampunk acknowledges the inescapable polemics and political meaning of design and technical objects.

Steampunk reveals that objects and especially technology objects are embedded in the social and political. They are part of the construction of social values and meaning, not simply laden with meaning after the fact. As designers of technology we knowingly or unknowingly create design fictions that hold similar meaning and hold or express dominant values. Whereas Steampunk seems to wear its ideological views on its sleeve so to speak, in almost a naïve fashion it in fact points to the naïveté of assuming design and technical artifacts are not ideological in some sense or another. We can learn from Steampunk that design and technology objects are ideological, as they consciously

(Steampunk's implicit critique of today's industrial ethos) or unconsciously express (Steampunk's inner contradictions) cultural values and political meaning.

FINDINGS AND CONCLUSION

In this paper we have proposed Steampunk practices as a model for new emergent approaches to HCI. Focusing on the documented online practices of Steampunk makers, we have articulated several new perspectives on the concepts of design fiction, DIY, and appropriation. Among our findings we suggest the following implications:

- Design fictions can propel designs through the social meaning and values of designed objects;
- Design fictions are discursive and create diversity by allowing multiple constructions of meanings and values through design;
- DIY and appropriation techniques encourage, creativity, resourcefulness, and participation in the making of digital artifacts;
- DIY and appropriation techniques are alternatives to modularity and top-down design with respect to customization;
- Participatory cultures like fandom and online communities have the potential to create new cultural producers with diverse goals;
- Design and technology objects are ideological in that they consciously or unconsciously express cultural values and political meaning.

We contend that Steampunk's manifestation as both a fictional genre and a community of design practice are bound together by the powers of design fiction. Design fiction facilitates the feedback loops between Steampunk practice, Steampunk community, and Steampunk fiction. We argue that this analysis provides an important perspective on how design fiction, DIY, and appropriation can be used as strategies for HCI, while foregrounding the ways in which design is fundamentally rooted in questions of ethics, values, and identity.

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