Playful Hacking within Research-through-Design

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ABSTRACT
Research-through-design has gained popularity in recent years within HCI communities. This has followed with attempts to methodize and formalize design practices within research contexts. These attempts have been criticized as being poorly suited for design. As an exemplification of unstructured methods benefiting design research, we present playful hacking within research-through-design. In this paper we share findings from two years of using this approach as part of research-through-design. In our approach, hacking is inspired by play and conducted within an office as a hacker's playground environment. We have found playful hacking to generate outcomes such as improved collaboration, exploration, and discussion while also generating unanticipated outcomes such as reusable design work and pre-study findings. Above all, we found that hacking provided motivation and invigoration to do more making and research in general.

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Research through design; hacking; interaction design; play

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H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Recent years have brought popularity to research-through-design (RtD) as an approach to research within human-computer interaction (HCI). Introduced to HCI based on Frayling's notion of research-through-design (Zimmerman et al., 2007), this approach has found usefulness in dealing with constraints and wicked problems by employing design practices and methods. The popularity of RtD has followed with attempts to formalize it (Zimmerman et al., 2010), owing to the benefits from the methodical nature of science. Although such attempts have been criticized (Gaver, 2012), it is still difficult to measure outcomes and evaluate contributions from RtD (Kelliher and Byrne, 2015). Some design research methods, such as annotated portfolios (Bowers, 2012; Gaver and Bowers, 2012), can begin to address this concern by enabling some

generalization, or by contributing as an intermediary outcome (Kelliher and Byrne, 2015; Löwgren, 2013). These discussions have often been oriented toward the artefacts and research outcomes of RtD—stemming from the debate about its legitimacy within academia—with less attention being put on the process by which these artefacts are created (Zimmerman et al., 2010). In this paper, we analyse our own process of doing research-through-design. Specifically, we introduce our approach to playful hacking conducted within a research environment. We discuss hacking as intrinsically motivated making, which is not driven by the expectation of research outcomes.

Design practices can benefit from agile and opportunistic approaches (Hartmann et al., 2006), but formalized methods prescribe directed outcomes, not serendipitous progress. Furthermore, processes in academic environments are often highly structured, lending to tackling large scale projects following waterfall-like models. In our experience, this comes with side-effects such as underutilised expensive equipment and commitment to poor design realized only too late; research environments are not necessarily well adjusted for messy design practices within research. Our work within interaction design (IxD) involves substantial exploration and divergence in both problem identification and solution generation such as captured in the Double Diamond design model (Norman, 2013). Design benefits from exploration, but it does not necessarily fit well into highly structured contexts. As a means of supporting design exploration, we started hacking playfully and worked toward its articulation. Considering the concerns about formalization of design, we address the 'why' of playful hacking, by attempting to understand how the values imbued in our approach have supported its usefulness in research, leaving the 'what' and the 'when' as subject to each designer.

In this paper, we discuss playful hacking as a constructive process of play situated within research-through-design. We evaluate our approach drawing on insights generated from two years of reflective practice. We argue for why hacking works for us, informed by practice and theory. Playful hacking is an ultimate particular design *process*; it is not *the* way to hack, but *a* way to hack within research. We present this as the sum of hacking practices and playful values, highlighting the need to be more aware of values underpinning research practices.

OVERVIEW OF OUR HACKING PRACTICES
We are *not* self-identifying hackers, we are researchers practicing research-through-design (Zimmerman et al., 2010), however, when we are not engaged in research, we often hack. For us that means getting lost on side projects

just for the fun of it and without a concern for responsibilities and outcomes. This involves working on projects outside of the scope of our research and includes activities such as making, discussing, reflecting, and writing. We are drawn to hack with intense and sporadic motivation. To us, our hacking is play and its related practices share a spontaneous, uninhibited mindset toward doing it just for the fun of doing it. In a sense, we are engaging in a "voluntary attempt to overcome unnecessarily obstacles" with a lusory attitude (Suits and Hurka, 2005), a mindset that Bernard Suits described as required to play a game. Considering the roots of hacking as emerging around projects such as hacking the PDP-1 to create one of the earliest digital games, Space Wars (Levy, 2010), how better to frame hacking than as play.

We share a small office filled with cheap over the counter technology for our research. This office space is the same environment we hack within, making our office both a place of work, but also our playground. We have a whiteboard, a plethora of electrical components, Arduinos, software development kits and access to web hosts and other Cloud services. Our office has no limitation to the space allocated for hacking. A typical week includes anywhere from about 1 to 8 hours, averaging about 4, of hacking. When we schedule time to hacking, we do so only to maintain a momentum, but not as a planned structure.

Our hacking projects are usually tangentially connected with the design spaces of our research, but they do not directly investigate the same problems or research questions. These projects are not completely haphazard; general theory provides us with a space for exploration (Kelliher and Byrne, 2015). While hacking can contribute toward our research, this is not its immediate goal. We hack simply because we can and because we want to.

Hacking as Play
We started hacking out of self-motivation and a "just do it" attitude, approaching it as an act of play. Through two years of practice, we have reflected on and iterated our hacking approach, while also considering theory on motivation, design research, and play. Moreover, hacking as play can be highly productive and relevant, but as we will discuss later, an under-appreciation of the values that support it can undermine this approach.

One way that hacking has contributed to our practice is framing it as play—an end in its own. This autotelic nature of our hacking practice, mixed with autonomy to decide how it is enacted—both major constitutes of play—fuel intrinsic motivation as suggested in the Self-Determination Theory (SDT) (Deci and Ryan, 2010). We avoid extrinsic motives encroaching hacking and emphasize a playful attitude. We considered how the office context, such as the culture and material affordances, can support playful characteristics. These characteristics such as spontaneity and enjoyment embody a rejection of heavily structured "method-ism" while also supporting ready-to-hand practices (Introna and Whitley, 1997), leading toward an office being more of a playground.

We have found that hacking for us is more of a mindset of playful making than a specific method. Using this frame, we now describe the main values—as sort of manifesto— that we imbue in our hacking as the philosophy behind it.

Minimal Viable Product
What is the smallest value contribution you can cobble together? What can you achieve if you have only one hour? None of our hacking projects exceed four hours at a time, allowing us to quickly test our hypotheses early on.

Hacking as Play
All of our hacking work is intrinsically motivated—we make the projects we would like to make and/or use and use this as a motivation. We are careful to exclude research problems in our hacking which might turn play into work.

Making Mode of Thinking
Just do it—don't think too much about it. Design the bare minimum, turning the "what if" into the "what". Use the process of making and reflecting to contribute to thinking.

End in Itself
We approach hacking as its own end. Outcomes are not planned, but arrive unexpectedly. Contribution to our research is indirect, but nevertheless evident in hindsight.

Loose Structure
We structure our hacking only enough to maintain a momentum in our scholarly discursiveness, or exploration, while prioritizing research demands.

INSIGHTS FROM TWO YEARS OF HACKING
Taking stock of the last two years, we have reflected upon our playful hacking practices within the context of research. With dozens of projects, failures, variations, we present our insights into what went (mostly) well in supporting research including some examples.

Figure 1 – Our hand-crank powered SAD lamp that borrows technology from a plant growth project for a yet unknown purpose.

Playful Possibilities in Making within Constraints
In our conventional research-through-design practices it is common—yet paradoxical considering its iterative nature—to be swept up with over-thinking problems and working towards ideal solutions. These ideal solutions can require resources not available to us: motion capture technology, robust 3D printing, even basic DC power supplies. Through our hacking we take a different approach shifting from "what do we need" to "what do we have". A broken old clock serves as a potential frame for a project, or a damaged laptop power supply can be used with a few cheap resistors to power a SAD (Seasonal Affective Disorder) lamp project (Figure 1). By shifting

our thinking toward "what do we have" we expose the possibility space, i.e. what can we achieve with what we have. Consequently, through our hacking, and despite our limited resources, we counterintuitively found and explored more possibilities. We also finding it enjoyable to work within those constraints. This fits into one of the mostly used definitions of play: free movement within a more rigid structure (Salen and Zimmerman, 2004).

Thinking Laterally through Tangential Design Space
In maintaining several ongoing hacking and research projects, we immersed our design practice into different technologies and problems concurrently. Hacking projects that we had previously been working on would influence what we are currently working on. The previous projects expanded our apparent possibility space of design by helping us think laterally about approaching design problems. For example, a cloud-based Internet of Things project—a button that sends a message inviting our closest colleagues to join us for a coffee—would expose otherwise unobvious tools and technologic approaches relevant to the next project, an ubiquitous game. When changing tools and technology, we would bring that influence with us where it might not otherwise be obvious, such as offloading networking features to the cloud, even when we want interactivity to behave as local networking—giving us alternate design solution to technical problems. This also highlights the agency that materials exert over the design process (Tholander et al., 2012) and its subsequent enrichment.

Abstraction through Action
The 'get it done' attitude from hacking influenced our design approach. We shifted from heavy discussions in the hypothetical to tangible results. Though arriving at results is not easy, especially when considering the limited resources available to our hacking. Consequently, our hacking pushes us to abstract our design problem – we boil it down to what is really important, the "minimal viable product" (Ries, 2011). Our hacking works within the constraints to deliver real results that can subsequently be evaluated and, eventually, iterated on. We found a lot of our projects being dead-ends, but still meaningful endeavors contributing to our understanding of a particular research problem. As it is difficult to measure outcomes in RtD, it can inhibit design work until theoretical concerns are resolved. Hacking allowed us to figure out the meaning of it later, leading to more work done overall.

Reusing Artefacts for Rapid Future Experimentation
Not only did hacking projects influence our design, but it also contributed to prototyping. Work toward one project might be later appropriated for use in a different project - significantly cutting down future development time. Basic software sub-systems, electrical systems and assemblages laid the foundation to rapidly prototyping future projects. For example, the logic developed for two previous projects allowed us to hack together a playfully social writing system in a day. The significant back-end logic allowed us to track and share our writing progress in a distributed working context with only a few lines of code and a simple LED setup—creating an otherwise complex system extremely quickly. The skills and design artifacts later accelerated our research projects.

Using Play to Motivate Engagement
We hack not for the outcomes but for the process. We found this highly motivating. Research is often approached formally and with instrumental expectations (i.e. as work) and consequently projects are expected to generate outcomes. If we took such an attitude to hacking, we would not have made the projects that we did. Hacking has provided us energy and excitement, both independent to and directly related to our research. Hacking as play was both a learning process and a necessary tangent, an escape from more stifling work. However, this type of making has come with tension in academic cultures. It was too sporadic and unfocussed. Hacking was not immediately or directly useful in the pursuit of outcomes, but allowed us to find a channeled outlet for our curiosities and tangential motivations It allowed us to just do, even without clarity or the why other than for the want. This helped us maintain engagement in making, reinforcing our research-through-design while also providing flow-on side effects.

Figure 2 – Our soldering workspace, including some of our miscellaneous parts and in-progress hacks.

Increasing Collaboration through Common Ground
Hacking has transformed the way we discuss and collaborate. Research can be individualistic, isolated, and often without immediately obvious overlap. It is sometimes difficult to find common grounds to collaborate on projects. This is paradoxical considering the fact that such a collaborative dynamic may be profoundly productive in terms of academic research. In our hacking we avoided any particular research agenda allowing us to share a common ground and work together without our egos in conflict. This enabled us to observe how others work and think, becoming an enriching and learning experience. This collaboration further provided us a shared language to discuss each other's design and research at large allowing us to collaborate more in the "real work".

Moving from Discussion to Making and Evaluating
While hacking collaboratively increased discussion anchored around our design processes and outcomes, at the same time it reduced our theoretical discussions or "armchair speculation" over coffee. The "what if" discussions become action. Instead of speculating, we encouraged ourselves to design and evaluate quickly thereby overcoming our presumptions and working towards (albeit crudely) validated understanding. Hacking allowed us to test our micro-hypotheses or assumptions which informed our research trajectories and core projects both quickly and cheaply.

Thinking Slow but Quickly Making

Without the pressure of delivering outcomes affecting hacking, we could take as much time as we let ourselves. This allowed us to stop, think and discuss with different frame of mind. Perhaps we would get into a deep discussion about the morality of opt in/out design using a button, for example. Not all of this time was well spent, but in many ways hacking enabled us to improve our thinking and understanding by approaching problems from various angles and with the opportunity for greater depth at earlier stages. We found hacking to increase our design exploration and divergence, but within the scope of theory, and also as a means to generate unexpected outcomes (learning through doing, reflection, and re-usable design work) to support our outcome-oriented RtD practices such as seen in Figure 3.
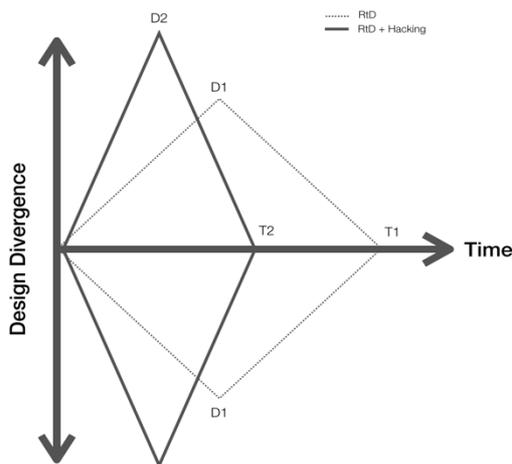

Figure 3 - Hacking amplifies divergence phase (from D1 to D2) while reducing convergence time (from T1 to T2).

Emphasizing Play to Embrace Failed Hacking

Despite our explicit agreement and emphasis to approach our hacking as play, we sometimes found ourselves overthinking outcomes and trying to find research value—specifically treating hacking as work and wanting outcomes without risk. We found some success in overcoming this by using exercises encouraging failure and dead-ends. For example, one ideation technique we employed was "10 Bad Ideas in 10 Minutes". This reinforced the notion that most ideas will be discarded and forced us to disengage with concerns directed immediately toward our ends in research. As a lot of our projects were "dead-end" tangents, we forced ourselves to find some meaning in the failure by reflecting and identifying some insights to integrate toward future practice.

DARK SIDE OF HACKING: PITFALLS AND CONCERNS

At this point we should highlight that this way of design research has several downsides that must be considered (or even accepted) as part of implementing such an approach.

One of the challenges that we have faced is that hacking hours often become a compelling form of procrastination; as it is unplanned and unstructured by its nature, it can disrupt more pressing commitments, providing a great (and fun) excuse to defer research and important duties. It can be difficult to find a balance between employing this energy to do meaningful hacking or simply rationalize a way out of doing work.

As a result of its experimental nature, sometimes our hacking hours are wasteful, without anything valuable eventuating. It is important to consider when to cut your losses while also trying to extract something (e.g. by asking ourselves "why is this a dead-end?"). As hacking enabled us to generate many design artefacts, we found some usefulness in informally reflecting on and explicating the projects in light of each other. In our ongoing revision of hacking, we are investigating more formalized research practices such as annotated portfolios and working papers as structured exercises to reify the otherwise unseen results of hacking.

We also believe that this approach may be problematic in certain environments and organizational cultures in which playfulness is not welcomed or where it may be seen as counter to reliable structures of productivity. Our hacking practices are designed as an act of play which affords us the motivation to engage in these practices. Research environments that might try to capture hacking as a research practice toward an extrinsic goal could undermine the value-generating process we have sought to create.

Finally, because of the material and time limitations, the designs may promote superficial thinking or even reductionism. However, this is, as with all the other elements of its dark side, part of what makes this approach such an enriching research experience. For us, research always requires us to fully engage with the problems' complexity, therefore this method should be always complemented with deep, critical reflection throughout and after the hacking process. We use hacking to understand not simply about each hack, but the problem space altogether and this requires reflective practices supporting ongoing integration.

CONCLUSION

As researchers taking a research-through-design approach, we have experienced a lack of supporting processes and institutions for our designerly methods, a concern that has been shared with our peers. As an answer to this, we put forward playful hacking, a process of hacking activities imbued with playful values engaged within research-through-design. We have found hacking to enrich our research practice and to help balance linear, outcome oriented research activities. In a sense, playful hacking is reminiscent of the learning and creation experienced by children playing with Lego, but nevertheless useful for adults with a growth mindset in research.

We present our playful hacking process as a starting point for researchers engaged in research-through-design to reflect on the values underpinning their research practices. We further present insights from two years of reflective practice to highlight the value of play within research to support increased creativity, collaboration, and above all motivation in research, even though it may appear inefficient when evaluated in isolation. Using our process as an example, we encourage researchers to mix playful making and hacking as part of their research culture.

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