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Towards programmatic design research

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The notion of design research entails research where design practice forms part of the knowledge production. Based on our characterization of the nature of design, we propose to conceptualize this kind of research as programmatic design research. Two ongoing PhD projects in interaction design are presented as examples of programmatic research processes, highlighting issues to do with the virtues and qualities of the processes, the interplay of optics and engagements in a hermeneutical dynamic, and the production of takeaways for the academic community.

INTRODUCTION

The essential purpose of academic research is to produce knowledge, but this general interest may take many different forms. In the sciences that discover and describe, knowledge is typically produced for purposes of explaining, understanding and predicting. Another knowledge interest, common in fields such as engineering, is to construct. Our focus here falls within this latter category, which might be called constructive research. This entails exploring possible futures and future possibilities, as well as questioning the current and the existing. Constructive research entails catalyzing change. In this broad sense, it relates very closely to design practice.

Specifically, we are interaction designers working in interaction design academia. The heritage of academic traditions and research paradigms in interaction design is mixed, to say the least; recently, there has been increasing interest in the interdisciplinary field known as design research. This field has been concerned with design practice for well over forty years, across the different design disciplines and design materials, and its aims have always been analytical (understanding design practice and design culture) as well as constructive (improving design practice and the designed world).

For a quick overview of design research, refer to Cross (2007). At the time of writing, the appropriation of design research by the academic interaction design community is marked by some tension concerning the primacy of established research paradigms versus the potentially unique nature of design practice in the context of knowledge production (see, for example, Zimmerman et al., 2007; Bang et al., 2012; Gaver, 2012).

This tension forms our point of departure, in that we find design practice to possess a few distinctive characteristics and that we believe those to represent a significant potential from the point of view of knowledge production. Moreover, we believe that design research should produce design knowledge, i.e., actionable knowledge that can be appropriated by designers (including designers working in academia, like ourselves – the people we henceforth call designer/researchers).

Our particular focus here is the concept of design programs and how that concept can be appropriated into programmatic interaction design research, as we find it to be the most promising candidate for conceptualizing a fruitful designer/researcher stance. After brief introductions to interaction design and the concept of program, the main part of the article is devoted to reflection on two ongoing PhD projects in interaction design, framed as programmatic design research projects. We identify and discuss a number of issues that emerge as significant in our exploration of the potentials of a programmatic approach.

THE NATURE OF INTERACTION DESIGN

As stated earlier, we consider interaction design as a design discipline akin to, e.g., architecture and product design. Due to the mixed heritage of the field, the literature and professional practice offers a broad and somewhat inconsistent range of definitions of interaction design. We have no intention to confuse the situation further, but rather prefer to confine ourselves to presenting our own sense of interaction design's core characteristics.

First, it must be established that interaction design involves a balance between two key aspects: Craft and context. We see interaction design as a craft where the designer must know their materials intimately. At the same time, interaction design is essentially about the whole context of use, where artifacts are always embedded in practices and the designer always needs to address the whole.

Given this balance between crafting (digital) materials and intervening in use contexts, we find that interaction design can be characterized in five points.

1. *Interaction design entails changing situations by shaping and deploying artifacts.* In other words, it is about transformation – and the means available to the designer to catalyze transformation is primarily artifacts.

2. *Interaction design is about exploring possible futures.* On one level, this is a truism, but it still deserves pointing out that design involves proposing artifacts and practices that do not (yet) exist. This implies, among other things, that design processes are able to be curious and inquisitive, driven by what-if and divergence.

3. *Interaction design involves the framing of design situations and the creation of design proposals in parallel.* The notions of transformation and exploration imply that when we have designed an artifact, the situation in which it is used is no longer the same. In other words, there is no way to do exhaustive analysis first and then design to meet, say, an identified need. Instead, proposing artifacts and other interventions becomes the main route to framing key concerns in a future use situation.

4. *Interaction design entails thinking through sketching and other tangible forms of mediation.* Making sketches is literally how thinking happens in design, as opposed to merely copying something already thought out into a manifest form. This is true on the level of the individual designer as well as in collaborative settings.

5. *Interaction design addresses instrumental, technical, aesthetic and ethical qualities at the same time.* In the context of use, there is no clear separation of different kinds of qualities. Technical properties of an artifact influence the aesthetic qualities of the resulting interaction, instrumental choices of features have ethical implications, and so on. The inquisitive and explorative design process must be performed accordingly.

We find that these characteristics of interaction design hold equally true when design is practiced as part of academic knowledge production, even though the academic practice is of course different in other respects from professional practice. Thus, it becomes important to find a conceptualization of research that turns the characteristics of design into strengths rather than limitations or anomalies.

THE CONCEPT OF PROGRAM

In general design, the concept of a program refers to a set of overall intentions and desiderata guiding a possibly extended process of explorative design. The Bauhaus manifesto, for example, can be seen as an early and influential example of a design program. In recent years, the term is used most often in the context of architecture where it refers to the initial scoping of an architectural project. In the academic context, the best-known use of the concept is found in Lakatos (1978) who talks about programs as a way to capture how central frames of reference in science evolve over time.

The main credit for bringing programs to design research, even interaction design research, goes to Johan Redström who has explored the notion for more than ten years with various collaborators (Hallnäs et al., 2002; Hallnäs & Redström, 2006; Brandt et al., 2011). Examples of his work include design research programs in slow technology, interactive textiles and energy consumption. Redström's original notion introduced programs to design research in a relatively simplistic way, comprising a three-step iterative work process where the program was formulated, then realized through experiments, and finally results were formulated through reflection (which would possibly stimulate reformulation of the program). Over the years, his notion of programmatic research has grown richer, and particularly interesting for our purposes is his recent discussion of what he calls program/experiment dialectics.

The mutual dependency of program and experiment stems from the program's need for materialisation – that which will make the hypothetical world-view of the program into something 'real' – and the experiment's need for precise frames – that which makes the experiment into something more than tinkering or undirected exploration. A program is not just a program, but a program for something and it is this something that the experiment materialise [sic!]. (Redström, 2011)

In this quote, it is clear that programmatic design research is far from a simple three-step iteration; design practice, reflection, analysis and revision are deeply interweaved.

The influential power of the program depends on its suggestiveness, i.e. in what ways it is able to suggest a (consistent) way forward in the situations that occur, e.g., by enabling the participants to see certain potentials, to interpret what is going on, to decide what to do next, etc. This is a difficult role for the program, our provisional regime: while being open for the unexpected, it must at the same time be strong enough to maintain influence even when we are improvising, when spontaneous and intuitive. (Ibid.)

Here, Redström (ibid??) addresses the essentially evocative character of a program. This concurs completely with our experiences of sustained, explorative design research within a program and also what we have been able to observe recently in the academic interaction design community. It is not uncommon to find formal research questions or hypotheses retrofitted to the insights from explorative design episodes and used as structuring devices in academic presentations; we find it more fruitful to adopt a conceptualization that aligns with the nature of the work undertaken. Fundamentally, this is a consequence of engaging in design practice for purposes of knowledge production, and thus subjecting ourselves to the parallel framing of design situations and creation of design proposals (see above).

Compared with the seminal work of Redström (ibid??) and colleagues, our ongoing experience indicates a number of differences that motivate our presentation in the following. First, we find the nature of the work to be more holistic – a hermeneutical dynamic process of ‘doing the program’ rather than a dialectic of program and experiments. This also implies that we locate knowledge contributions in the program as a whole, rather than in experiment outcomes.

Moreover, we find added clarity in distinguishing the programmatic work from the act of producing what we call takeaways. Programs are ongoing, rather than being projects with a start state and a goal state. In the context of academic research, though, there will always be periods of systematic reflection and articulation in connection with the publication of research results. Such periods tend to involve stepping outside the ongoing process of the program with a view towards eliciting and communicating provisional insights and outcomes, thus contributing to the collaborative

discourse that is academic knowledge production.

PRACTICALITIES OF PROGRAMMATIC DESIGN RESEARCH

The Tangible Participation program (Larsen, 2012) is a holistic take on design research into the pedagogical praxis known as Snoezelen (Hulsegge & Verheul, 1987), combining a view of knowledge production with a will to engage in the pedagogical field. The underlying agenda concerns exploring potentials of tangible computing to strengthen the participation of children with profound intellectual disabilities in the Snoezelen interplay between children, artifacts and pedagogical staff. The main research activity is a hermeneutic dynamic between interventions with design artifacts and conceptual unfolding through three main research foci: bodily awareness, digital animism, and more-than-a-button.

The main sources for unfolding the foci are (a) dialogues with members of the pedagogical staff around video recordings showing design interventions as the children visit the Snoezelen places, gradually distilled into tales of practice in the form of re-edited videos of interplays, body-storming sessions, anecdotes and even fantasies; and (b) building new design artifacts for the interventions, eliciting consequences and stimulating further constructive curiosity. At the same time, the expanding body of understanding and ideation frames and questions the ongoing and intertwined processes of dialogue and building. To this end, a range of what we call design engagements has been developed to combine critical, generative and participative purposes. The design engagements go beyond the classical designerly notion of prototypes as products-to-be, and they combine probing, inspiration and exploration in ways that break the structures of classical sequential design models.

On the whole, the research process of Tangible Participation is not merely iterative, but rather non-linear and serendipitous as it draws on designerly knowing (Cross, 2006) as well as the pedagogical staff members' professional judgment, foregrounding the richness of tacit knowledge and of the concrete (Flyvbjerg, 1991). The aims go beyond grounding research findings in the conventional sense or eliciting qualities of a set of novel artifacts, and extend into developing a practice through design engagements and designerly knowing. Reciprocally, authentic engagement with Snoezelen practice challenges core academic notions such as the nature of tangible computing

and embodiment. On the whole, the program seeks a balance between staying open to the concerns and controversies of a field and at the same time promoting design agency.

The program of Designing for Homo Explorens seeks to create a design perspective that builds upon Huizinga's (1955) perspective of homo ludens, where play is at the core of how humans engage socially in complex environments. This is extended by considering these engagements as explorations of social meaning-making processes.

The research takes its point of departure in hands-on exploration of interactive art installations at the collaborative studio Illutron, which served as a breeding ground for ways to design for playful social dynamics in public settings. In recent years, Illutron produced a broad collection of experiments and large-scale installations for public use, mostly in playful settings such as festivals and events. When they were deployed and used by many thousand people, it was repeatedly found that they were not always used as intended – but rather in novel and even disruptive ways that the designers could not predict. The curiosity-driven experimentation with interactive technology turned into an investigation of the social dynamics unfolding around the experiments.

The research process has involved analyzing previous experiments as well as designing new interactive pieces and installations, gradually crystallizing into a manifesto of designing for homo explorens. The manifesto represents a synthesis of insights gained in the research program, and presently it comprises the following themes. Design for the unexpected: Instead of designing from a problem solving perspective, designing for homo explorens encourages designs that enable unexpected interactions to unfold. Create exploration through mediated complexity: Instead of aiming to create optimal (noise-free) information carriers, it is encouraged to design mediated systems with higher level of complexity. Play with the intimacy of full-body interactions: Acknowledge the importance of the interaction aesthetics and how we as humans use our whole bodies to explore social relationships. Create social playfulness through distortions of situated norms: By playing with the boundaries of social norms situated in public settings, people can be challenged to collaboratively renegotiate their shared experience. Let them become performers of their own narratives: We can design interactions that embrace a multi-layered set of agendas and enable people

to take charge of their own performative roles.

Following this introduction, we now move on to a more detailed discussion of our emerging experiences from programmatic design research. The remainder of this section is structured into six themes, related through a simplified model.

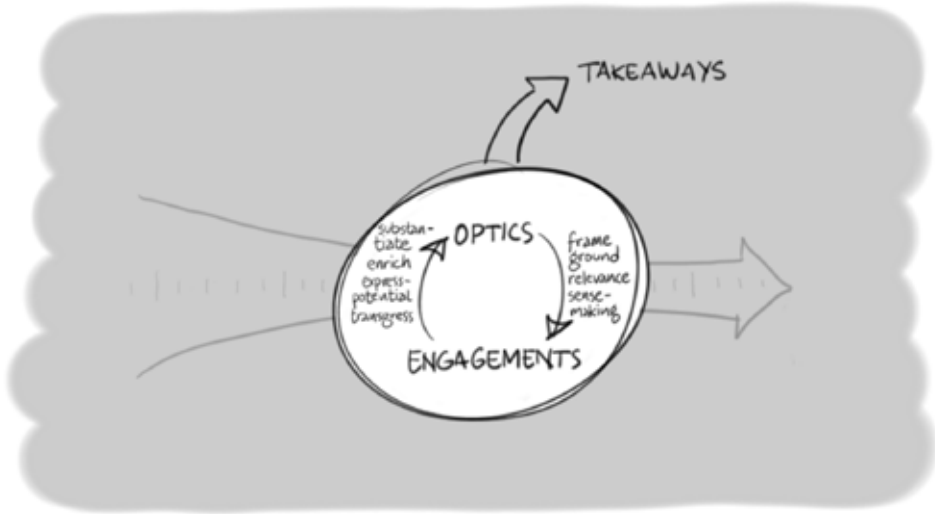


Figure 1:
Caption: A model of programmatic design research.

The model aims to illustrate programmatic design research as follows. The core of the ongoing work in a program is a hermeneutic dynamic (refer to Jahnke, 2012, for an introduction to hermeneutics in design) between the parts – which we call engagements, referring to all manners of design interventions and constructive actions – and the whole, which we refer to as the optics in an attempt to find a relatively neutral word that suggests ways of seeing and ways of thinking. The line around the core loop represents the provisional and ongoing act of framing the program, its scope and extent. The arrow from left to right emphasizes the fact that the program changes and progresses over time. Finally, we indicate in the top right that eliciting takeaways from the program, such as when preparing an academic

publication, represents an act of remediation leading to another entity that is not the program itself. That entity can be seen as static when compared to the program, but on the other hand it enters other processes of ongoing discourse and languaging (Krippendorff, 2006), such as the collaborative knowledge production of an academic community, where new dynamics take over. This is beyond the scope of this study, though.

Using this simple, yet hopefully evocative model, we now examine the following themes in more detail based on our own experiences of ‘doing programs’ and communicating them to our academic community.

What is our sense of the nature of programs in programmatic design research? What are their general virtues and qualities?

How can we characterize and exemplify optics and engagements in more detail, and how can the hermeneutic loop between them be understood?

Finally, we address the question of how a program can be remediated into takeaways, and specifically for the purpose of forming contributions to our academic community.

For reasons of space, the topic of programs evolving over time is left out of the subsequent discussion. Suffice it to say here that we acknowledge a temporal dynamic in which programs unfold, develop and possibly spawn new or related programs (see also Redström, 2011, on termination criteria for a research program).

VIRTUES AND QUALITIES OF PROGRAMS

First, as indicated by our use of the concept of a hermeneutic dynamic, a program is holistic. This means that it forms an organic and dynamic whole, rather than comprising piecewise answers to detailed research questions, retrospective problem formulations, or isolated intermediate-level knowledge contributions (Höök & Löwgren, 2012). Thus, a program has a degree of flexibility in the sense of keeping the pieces up in the air instead of prematurely pinning them down. A program is more aptly described as a provisional knowledge regime (Binder & Redström, 2006) that is situated and evocative. In other words, it is grounded in a particular praxis or setting and in people’s ongoing meaning-making, and within that scope it suggests, foregrounds and puts into perspective possible courses of designerly action. In our cases, the Tangible Participation program is grounded in a particular type of pedagogical praxis, whereas the Homo Explorens program is

grounded in the praxis(es) of social play.

The evocative nature of a program, thus, entails engaging in a praxis with a view towards action. Such action is generally explorative; participants engage in design activities with the intention to learn and to examine possibilities. This is an important observation in the context of a design tradition where design activities are sometimes performed to persuade, and where design is sometimes blackboxed as a *deus ex machina*. Engagement further implies an orientation towards initiating change, as opposed to, e.g., instantiating a theory or corroborating a hypothesis.

OPTICS

We now move into a more detailed discussion of the components of our model, drawing on examples from the two programs as appropriate. The notion of optics represents the whole in our hermeneutic loop, the way of seeing that guides the provisional interpretation of the concrete engagements. As an example, consider the Bodily Awareness focus of the Tangible Participation program. This focus highlights, among other things, the notion of embodied coupling that guides concrete engagements. An early and generic design sketch, called the ActiveCurtain, addressed embodied coupling by giving the children possibilities to affect the otherwise non-interactive moving projections so widely used in the Snoezelen context. ActiveCurtain in its simplest form added a soft interactive third dimension to a projection, enabling physical poking and leaning into deeper layers of color; thus closely coupling cause and effect in time/place to bodily sensations. Further work within the aspect of embodied coupling ensued, and led to a sketch of a water-bed where sound would be coupled to the delayed push-back following from laying down on the bed and then rocking back up as the wave of water inside the bed rebounded. The point of this example is that before the water-bed sketch was made, the notion of embodied coupling implicitly entailed instant feedback. After the water-bed, embodied coupling and thus the whole focus of Bodily Awareness gained in richness with respect to temporality and rhythm, and specifically in the sense of organic inertia and delay. Generally speaking, the optics develop through the engagements (as well as framing and enriching them, of course).

Another example is the notion of aesthetics of interaction (Petersen et al., 2004), forming an essential part of the optics in both of our programs. All

engagements are guided by the desideratum (Nelson & Stolterman, 2012) that the aesthetic qualities of interaction are distinct from, e.g., static visual aesthetics and have to be addressed as such. What this means, among other things, is that design sketches and other artifact-oriented engagements can only be assessed if they can actually be interacted with, or, in more straightforward terms, that sketching has to be done in hardware and software. The richness of the aesthetics-of-interaction notion, however, obviously grows as work proceeds within the program. At the time of writing, for example, the Homo Explorens program entails a growing sensibility to the aesthetic qualities of perceived complexity, and particularly the enticement of balancing challenge and mastery in the realm of social play. In the Tangible Participation program, on the other hand, aesthetics of interaction are developing towards a participatory design stance.

ENGAGEMENTS

The parts of the hermeneutic dynamic consist of designerly actions, which can take a wide variety of forms. However, from the general notion that a program engages with a praxis it follows that the engagements can generally be seen as interventions and steps towards interventions.

It is common in our work to make a design sketch in order to facilitate participation, and more specifically authentic participation in an agonistic process (Mouffe, 2000) of collaborative exploration as opposed to token 'participation' where practitioners get a chance to try out a proposed solution or serve as subjects in a formal empirical evaluation. One example of this approach, which also goes by names such as probing, designing-for-debate or provotyping, is the LivelyButton sketch from Tangible Participation. LivelyButton is a relatively large, light-emitting surface that can change color in response to touch. What is distinctive about it is that it responds not only at the moment of touch but rather starts 'behaving' shortly before contact. Moreover, in addition to the change in light color and pattern, the surface moves slightly accompanied by vibrations and the sound of a motor. The point about LivelyButton in this context is that it is made as a pastiche of the dominant interaction materials in existing Snoezelen praxis: large on/off buttons, soft materials and psychedelia projections. It is clearly a situated commentary and an invitation to a debate, rather than a testable solution to an isolated problem.



Figure 2:
Caption: LivelyButton in use.

Similarly, the Homo Explorens program operates with the concept of engagement as perturbation, as illustrated by the Mediated Body sketch. Briefly, Mediated Body (Hoby & Löwgren, 2011) consists of a performer wearing a digital system including two pairs of headphones. When a participant enters a session with the performer, and they both put on the headphones, an elaborate light- and soundscape appears as they touch each other's bare skin. The sensation of exploring the soundscape by touching and being touched by a stranger turns out to be socially transgressive as well as experientially captivating. Mediated Body was initially deployed at the Burning Man festival, where the whole setting is extravagantly dedicated to social play and self-expression. When it was later taken to the streets of Berlin in mundane, everyday urban life, its transgressive interactions represented a much greater degree of perturbation and disturbance.



Figure 3:
Caption: The Mediated Body in use at Burning Man.

The concept of engagement as intervention also implies a sense of working in the wild. To return to the example above, the week at the Burning Man festival included not only documenting the use of Mediated Body in hundreds of social play sessions but also continuously modifying the sketch in response to what was learnt. The exact behavior of the soundscape and the lights in response to the touch signal detected between Performer and Participant evolved during the week. In particular, the idea of an aura (i.e., detecting and responding to near-touch) was introduced to Mediated Body in this phase – an idea that currently occupies a central generative position in the Homo Explorens program.

When we say that engagements entail working in the wild, it also means that the distinction between lab, field and showroom sometimes found in contemporary accounts of design research (Koskinen et al., 2011) needs to be reconsidered. When we are tinkering with the Mediated Body sketch through programming and soldering in a tent in the Nevada desert, is that an example of lab work or fieldwork? When we make LivelyButton as a commentary inviting situated debate within the ongoing transformation of a praxis, is that a showroom piece or something else? It should be clear that

the concepts are of limited use when it comes to characterizing the nature of programmatic design research.

Finally, we want to note that not all engagements in a program need to take the form of artifact-centered design sketching. An illustrative example here would be what we call video deliberations within Tangible Participation. Briefly, the idea is that staff members collect video recordings of what they do in their daily work with the children and the design artifacts, and bring those recordings to meetings with staff members from the other Snoezelen sites engaged in the project. In those meetings, the videos serve the multiple roles of enriching communication and deliberation (they are referred to by staff members as ‘videos from when we would like to call each other and say LOOK!’ and ‘videos that tickle’) and of giving the children a distinct place at the table. For further details, refer to Larsen and Hedvall (2012).

THE HERMENEUTIC LOOP

Saying that the loop of optics and engagements is hermeneutic also means saying that it is an organic whole, a process of ongoing interpretation where optics inform engagements and engagements inform optics. We find this to be a fundamental characteristic of programmatic design research, and hope that we have substantiated it somewhat already in the preceding discussion. Here, we want to address a number of further issues pertaining to the nature of the hermeneutic loop.

Ongoing interpretation does not imply incremental progress in any simple sense. For example, consider the level of provisional articulations in Tangible Participation. The video deliberations mentioned earlier initially yielded what seemed to be blatant contradictions from staff members on the qualities observed in the recordings. However, a pattern started to emerge where it became clear that staff members unknowingly addressed different aspects of the interplay while lacking a shared or articulated view on situated relevance. This led to the introduction of a rough model that distinguishes attention aids from basic cause and effect, and from the aesthetics of interactive behaviors. In essence, the work is now at a level of revisiting and learning from interventions that initially seemed indeterminate. It is clear that the design artifacts, providing hitherto unfamiliar levels of interactivity, played a significant role in this process by raising concerns and catalyzing controversies (Binder et al, 2011).

The role of theory is another significant topic for reflection. We stated earlier that a program is driven by engaging in a praxis rather than by instantiating a (general) theory. However, this does not mean that a program is atheoretical. In our experience, the relation between program and theory is a dynamic one that includes pull as well as push. In other words, the ongoing optics/engagements interpretation might lead the researcher to identifying needs for theoretical constructs, such as when work in Tangible Participation pushed towards emphasizing bodily awareness as a deeper sense of embodiment and the lived experience (cf. Johnson, 2007; Levisohn, 2007). Conversely, academic prudence (i.e., the requirement to position the work by identifying appropriate theoretical frameworks and, indirectly, appropriate academic communities) suggested early on that Homo Explorens should relate to performance theory (Schechner, 2002, 2003; Dalsgaard & Hansen, 2008). This suggestion initiated an extended process of appropriation and interpretation, during which fruitful performance-theoretical constructs were identified and eventually grew into elements of the Homo Explorens optics. Specifically, the notion of performative immersion (referring to the duality of being immersed in the interaction experience and at the same time performing in a social setting, as illustrated in, e.g., Mediated Body) has proven resonant and generative up to this point. The appropriation process also made clear, on the other hand, that the Homo Explorens work should not be expected to result in contributions to general performance theory as such. The same goes for Tangible Participation with respect to general theories of bodily awareness.

To conclude this section, our current position is that rigor in the academic sense is provided by the program. What we mean is that the choice of a particular engagement or a particular articulation is not arbitrary or isolated. Rather, it follows from the progression and the current state of the program, in terms of its optics and engagements. Rigor is related to academic soundness and criticizability; our position implies that specific moves in programmatic design research generally make sense in a coherent way, but that sensemaking is based on a holistic, dynamic process of evolving interpretation. We will return to the implications for academic communication in the next section.

TAKEAWAYS

Finally, in the context of academic research the issue of scholarly communication is always at the fore – in a sense, your work is only as good as your contributions to the academic community you affiliate with. Our position is no exception in this regard. Thus, the challenge we face is how to render a holistic, hermeneutical process of design knowledge production in the medium favored by the academic community of interaction design – i.e., linear text with a few images and possibly multimedia supplements – and how to fulfill the quality requirements posed by that community.

Generally, the community we address consists of designer/researchers – colleagues engaging in design for purposes of knowledge production, and specifically within the academic subject of interaction design. In this community, the main currency is arguably design knowledge, i.e., knowledge pertaining to design that is appropriatable and actionable for designer/researchers.

Here, appropriatable means that the intended audience must be able to understand the material we communicate, and judge its significance and epistemological value. What this means in terms of more precise academic knowledge criteria depends on the exact discipline; different academic communities use different criteria, which in turn reflect underlying epistemological axioms. Generalizability, for example, relates to a universalist paradigm and means little in the context of situated, interpretive research approaches. One noteworthy attempt to overcome these differences is the suggestion by Booth et al (2008) of three overarching criteria: An academic knowledge contribution must be contestable, meaning that it adds something that the academic community being addressed finds inventive and novel. It must be defensible, such that the academic community being addressed finds the contribution to be empirically, analytically and theoretically grounded and the research process and reasoning rigorous and criticizable. Finally, it must be substantive which means that it is deemed relevant by the academic community being addressed.

It should be clear, however, that these criteria could be instantiated in different ways. Briefly, for us, relevance is a complex issue that is not limited to intra-academic assessment – since knowledge production is increasingly becoming a participative process involving multiple stakeholders also outside academia. Defensibility in the sense of groundedness, rigor and criti-

cizability is another complex criterion in the context of hermeneutic work and provisional knowledge regimes, and we personally find Lincoln and Guba's (1985) concept of trustworthiness to be the most appropriate approach. Suffice it to say at this stage that in any given academic community, there are ways to discuss whether design knowledge is appropriable.

Saying that our contributions to the academic community must be actionable, however, is perhaps less common sense in scholarly terms. Simply put, what we mean is that contributions are generative – that other designer/researchers find them evocative for their own design-for-purposes-of-knowledge-production. This in turn entails striving towards richness rather than conclusiveness, towards representations of experience and articulations that unfold rather than close, towards material that is open to multiple interpretations and reinterpretations.

Moving towards more concrete considerations of takeaways from programmatic design research, the first issue that presents itself is whether artifacts designed in the course of various engagements constitute or contain knowledge in themselves, or whether they merely serve as instruments for subsequent production of knowledge through, e.g., evaluation or systematic reflection. This is a long-standing issue in design research, even though Cross (2006) tried to resolve it by stating that artifacts represent knowledge in the simple sense that they answer the research question 'How would you design an X?' This Gordian-knot approach, however, breaks down when we move from isolated research questions to holistic programs. Similarly, our hermeneutic stance forces us to reject the conventional gallery notion that artifacts are self-sufficient in terms of knowledge.

However, we do find that artifacts represent important aspects of the takeaways from programmatic design research. This is partly because we aim for actionable contributions; it is generally acknowledged that the ability to design relies on a repertoire of partial 'solutions', and concrete exemplars are the raw materials from which such repertoire elements are appropriated (compare how traditional design educations emphasize studies of exemplary designs, canonical as well as contemporary). Another reason is that the artifacts and other engagements form parts of the hermeneutic process in the program, and they need to be discussed in relation to the abstractions and reflections in the interest of defensibility. The recently proposed approach of annotated portfolios (Bowers, 2012; Gaver & Bowers,

2012) appears to represent a promising approach here. However, what we find to be conceptually underdeveloped in this work is the notion of generative tensions, and we hope to improve upon best practice in that regard – for instance by taking seriously Peirce’s venerable point that every index (in the context of indexical signs) changes perception and implies some amount of shock (see Iversen, 2012).

A more generic problem, faced by any design researcher in producing artifactual takeaways, is that artifacts are not always easily rendered in text plus still images. In fact, this problem is particularly pronounced in interaction design of tangibles where interactive behavior, temporal dynamics and multi-sensory and bodily experience constitute the key design properties rather than static form, color and texture. We find that video is useful in some situations to communicate a richer sense of interaction aesthetics, but it is not a panacea. For example, the feeling of how LivelyButton presses against your hand is a tangible and proprioceptive experience that is hardly amenable to audiovisual mediation.

The Homo Explorens program illustrates another approach to takeaways, where the holistic nature of the program is embodied in a manifesto, defining a design perspective or stance in a number of terse imperatives: Design for the unexpected! Create exploration through mediated complexity! Play with the intimacy of full-body interactions! Create social playfulness through distortions of situated norms! Let them become performers of their own narratives! These challenging statements are used as themes to structure the overall communication of artifacts and abstractions from the program into the conventional form of a dissertation, and aim to support appropriation as well as action. By contrast, the Tangible Participation program juxtaposes multiple voices to convey a sense of the whole where pedagogical as well as designerly insights are intertwined in tales of practice. We might propose that the forms of the programmatic takeaways resonate with, or should resonate with, the praxis they partake in – from the outspoken extravagance of Burning Man to the placid tranquility of Snoezelen.

To conclude, it is the responsibility of the programmatic design researcher to provide takeaways that are suitable for appropriation as well as action on behalf of the relevant academic community. It seems to us that the key implication is to respect the holistic nature of the program: Communicate in ways that connect the optics and the engagements, that unfold

the richness of qualities to facilitate appropriation, and that relate comprehensively to existing knowledge in the community. This might be a workable, albeit deceptively simple, recommendation for contestable, defensible and substantive academic contributions.

IN CONCLUSION

We are in the process of exploring the concept of program for use in what we call programmatic design research. This piece is an attempt to articulate our foundational assumptions and the insights we are gaining along the way, with a focus on key issues warranting further discussions on research methodology within interaction design (and possibly also other academic subjects where design practice is part of the DNA). Specifically, we hope that our design-discipline perspective can inform ongoing work on design-based research within didactics and learning.

To summarize, we propose that design practice is a core activity in design research, which has a number of consequences for the research process and its outcomes: We need to respect the rich unfolding nature of the inquiry, opening up rather than narrowing. We need to constantly renegotiate the frame of the inquiry. We need to think in terms of perspectives rather than research questions, and provisional takeaways rather than results. And more than anything else, we need to think of our academic community as one that appropriates and acts. We find the notion of program to be useful in conceptualizing this form of research.

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Environments in Upper Secondary Schools*

INTERVIEW:
Diana Laurillard

