Making Spaces: How Design Workbooks Work

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ABSTRACT

In this paper, I discuss *design workbooks*, collections of design proposals and related materials, both as a method for design and as a design methodology. In considering them as a method, I describe a number of examples of design workbooks we have developed in our studio and describe some of the practical techniques we have used in developing them. More fundamentally, I discuss design workbooks as embodiments of a methodological approach which recognises that ideas may emerge slowly over time, that important issues and perspectives may emerge from multiple concrete ideas, potentially generated by multiple members of a team, rather than being theory-driven, and that maintaining the provisionality and vagueness of early proposals can be useful in supporting a quasi-participatory design approach that allows participants to interpret, react to and elaborate upon the ideas they present.

Author Keywords

Interaction design, research through design, ideation, design proposals, conceptual design, design spaces

ACM Classification Keywords

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

General Terms

Design

INTRODUCTION

In this paper, I discuss the creation, collection and use of *design workbooks* in our practice. Workbooks are collections of design proposals and other materials drawn together during projects to investigate options for design. They can be used at various points in the design process, but in this paper I will focus mainly on workbooks created during the early stages of projects. As I will describe, at din the turn from considering background research towards possible designs, are produced from an array of resources and using a range of techniques, describe design ideas to greater and lesser degrees of resolution, address a number of audiences, and take a variety of forms. What they share, I will suggest, is not just the description of a design space but its creation: through the multiplicity of design ideas they contain they implicitly suggest important issues, approaches and options that might be considered in designing for a given situation, and in their provisional nature show those ideas, approaches and options in the making and still malleable to change.

Design workbooks can be considered as a design method, and I discuss some of the practical techniques we use in our team to develop them. More fundamentally, however, workbooks are also evidence of, and a tool for, a methodological approach which recognises that ideas may develop slowly over time, that important issues and perspectives may emerge from multiple concrete ideas, potentially generated by multiple members of a design team, rather than being theory-driven, and that when the provisionality of early ideas is maintained in their expression, design workbooks can support a quasi-participatory design approach as people interpret, react to and elaborate upon the ideas they present.

Finally, design workbooks are also interesting for their own sake, as explorations of topics and approaches that extend beyond the eventual outcomes of design projects. This paper does not describe any particular workbook in enough detail to explore an associated design space in depth, but the illustrations I use may still be of interest for the domain-specific ideas they convey.

Of course, the use of design workbooks is hardly unique to our practice[1]. Producing and collecting proposals in one form or another is a fundamental process in design work. My purpose in reflecting on our practice here is two-fold: first, I hope to help other designers reflect on their practices by articulating our own, and second, by sharing this way of working more broadly I hope to help in 'dispelling the black art of design' [13] to those working within other methodological traditions.

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[1] The proposals shown here were developed by various design teams with whom I have worked; see the acknowledgements.

TWO WORKBOOKS

To ground the discussion, in this section I describe two early workbooks. These serve to illustrate the roles that workbooks can serve in the design process, and also some of the basic techniques that can be used in developing them. Later I will describe more recent examples, as I focus more closely on how workbooks can be constructed.

The Alternatives Workbook

The first workbook was compiled as part of a project on 'information appliances', a then-voguish concept of computational products specialised to offer one or a few functions with simplicity and elegance (e.g. [11]).

Dissatisfied with current examples of what such devices might be like, I spent some holiday time putting together about a dozen very rough collages of alternative devices that explored a range of personal and idiosyncratic possibilities. The images were constructed from pictures of household goods scanned from a catalogue before leaving on holiday, and thus were extremely limited in range and quality. For example, Figure 1 shows the image used to introduce the idea of an 'Objective View' camera. This was an idea for a device that could be launched tens of meters into the air to capture an image of the user in his or her surroundings, counter-acting the normal self-centred view of whatever troubling situation might be bothering them. Constructed from a picture of a corkscrew arranged over one of a bowl, the notion was that the swirling tail might indicate flight, and the indentation of the bowl could suggest a data receiver. Though crude, images such as this one seemed to work well when accompanied by relatively extensive descriptions to convey ideas that were, at the time, relatively unusual.

Figure 1. The Objective View proposal from the first, in-house Alternatives workbook.

This sketchy, quickly-produced workbook first evoked a rather bemused response from my partner on the design team, but ultimately proved effective in generating discussion and design explorations of other possible devices. As these progressed we decided to capture them in a more visually finished workbook for circulation to our sponsoring collaborators. Though still relatively simple to produce, the images used in this workbook included a number of new features: background images, electronic displays superimposed on everyday objects, and wholly constructed elements, all of which reflected both a greater range of available visual resources and more time spent using software tools such as Photoshop™ to develop images. For example, Figure 2 shows part of the image used to accompany a proposal for Placeholders, small electronic screens that could present information in the home independently from the computers that might feed

them. Though centred on an image of a postcard holder, similar to the everyday artefacts used in the first workbook, it is substantially augmented with a background image of a table and crockery, as well as constructed imagery of possible screen contents.

Figure 2. Detail of the Placeholder proposal from the second Alternatives workbook.

The completed Alternatives workbook included ten proposals, each presented on a double-page spread in A4 landscape format, bound together to form a small booklet. We distributed the workbooks to our partners on the project and described the ensemble in a meeting and presentation before leaving them behind. This was a key event in the project: the workbook made clear a domain of interest and a style of work that clearly influenced the rest of the project (for examples of later work, see [10]).

In addition, the workbook itself became the subject of a publication in its own right [6], in which we described the individual proposals and the overall design space they created. Perhaps most telling, for the purposes of this paper, was the argument that the proposals served similarly to a collection of prototypes, providing relatively concrete 'devices' that viewers could mentally simulate and critique as they might ones that were physically realised.

WORKBOOKS IN THE DESIGN PROCESS

As these examples indicate, workbooks can play an important role, both functionally and experientially, in early stages of the design process. In this section I treat them as a method for design, arguing for the benefits of making and using them.

A Turning Point

One of the most valuable roles for design workbooks is as a fulcrum in the transition from initial background research to the generation of designs to be developed. This stage of design is often a daunting one, when attention turns from the richness of an existing situation to the blank page of a design sketchbook. There are a number of ways to go wrong in making this turn. It can be tempting to develop ideas quickly and commit to the first one that seems satisfactory; or, alternatively, design teams may become suspended in diffuse discussions of situations and general possibilities they offer. Design ideas can be trapped in iterative versions of the status quo, or dislocated by technical possibilities that may have little to do with the context for design. Design workbooks can help to overcome and even profit from many of these challenges.

Buying Time

Resolving to produce a workbook at the outset of a design process makes clear that the object of coming up with ideas is not to define a final design directly, but to understand the nature of problems and possibilities to be addressed in a given domain. This means that a given idea does not have

to bear the full weight of a project's expectations, but there is still an obligation to act, and a requirement to concretise ideas, which are crucial in moving beyond vague notions of possibility. Considering whether specific proposals might work allows a clearer sense of promising design directions to be gained. In effect, workbooks are a tool in developing from initial research towards a brief for design.

Design workbooks are a mechanism to compel 'safe' creative activity (though often this encourages exploration of relatively 'risky' possibilities) but they also have the advantage of ensuring that this does not happen too swiftly. This is particularly appropriate for research through design projects, where the responsibility is to create original perspectives and possibilities, without many of the time pressures of commercial design projects. Producing workbooks can take days, weeks, even months, particularly when care is taken over the quality of images and text within them. Both the time taken to create proposals, and their treatment as contributions to a collection of ideas rather than a representation of final designs, can help in avoiding premature commitment to particular notions or even broad design directions. Moreover, a side effect of the time and effort needed to produce workbooks is the tendency to filter out unpromising ideas and to allow broad themes to emerge and grow. Effort follows enthusiasm: there is a tendency to represent the most intriguing ideas first, during which time other ideas may lose interest while new ones, based on the first, start to develop. This filtering can happen within a team as well as individually as proposals are shared and discussed. In this way, the process of developing a workbook is not just a matter of producing a physical artefact but also the ideas within it and a shared ground within the design team.

Externalising Ideas
Using images and text to express design ideas often entails developing those ideas. Creating workbook proposals is not a matter of externalising internal visions: trying to turn an idea into a proposal often reveals just how woolly and incomplete that idea is, and in developing the proposal one is likely to be forced to resolve certain of the its details in order to proceed. As I will discuss later, the kinds of representations used in developing proposals can usefully maintain ambiguity and provisionality, so that not all— indeed, not many—details need be resolved. Nonetheless, the requirements of capturing a design idea in images and text can be useful in forcing its further consideration.

Externalising ideas in the form of proposals acts as the first step towards realising them as independent entities, apart from their creator.   Sometimes proposals can take on a life of their own, for example when the resources used to externalise them shape their details in unanticipated directions (as, in an extreme instance, the limited images used in creating the first Alternatives workbook shaped those proposals; see Figure 1). Even when proposals develop in a way that conforms comfortably with the original notion behind them, their independent existence gives the designer an opportunity to view and assess them as if found rather than owned. Can I imagine this device /

system / service existing in the world? Would it be engaging? What's good about it? What would be annoying?

Moving an idea into the world also allows it to be seen in an external context, whether literally against a setting used in depicting the proposal or implicitly in its relationship to other products, prototypes and proposals that surround it. This process of de-identification with design possibilities, and of integrating them with the world, is valuable in allowing them to be assessed independently from an individual designer's likes and dislikes. They emerge from their creator's voice to take on their own,

Projecting Futures
Implicit in the move from appreciating an existing situation to considering possible designs is a turn from understanding the past and present towards anticipating possible futures. Most of our proposals are not 'futuristic', instead exploring possibilities that could already have existed at the time of their creation. Nonetheless, they point to a future, even if it is a future differentiated from the present by their realisation, and invite viewers to imagine what that future might be like.

Contrast with Design Scenarios
Many techniques exist for exploring the potential futures of proposed systems, many of which can be grouped under the broad category of design scenarios (e.g. [2]). Taking the form of storyboards, videos, or simple text descriptions, scenarios usually create narratives about people using the proposed system in different contexts.

Design scenarios can be very useful in allowing designers to work out and communicate how they imagine the systems they propose would be used. Moreover, developing scenarios can be a useful mechanism for working out the details of designs, just as externalising design proposals can motivate the development of the ideas behind them. In practice, design scenarios often share two characteristics, however, that can limit their utility. First, the majority present largely positive accounts of the experience and effects of using the systems they consider. This is not surprising, given that the work to develop design scenarios is usually motivated by enthusiasm for the systems they describe, and, insofar as scenarios are to be used to communicate the possibilities to other stakeholders, their authors want to convey that enthusiasm effectively. But it can be unfortunate, because a focus on intended use can divert attention from potential problems or overlooked issues, some of which may even lead to new and more promising ideas (c.f. [4]). The second characteristic that design scenarios often share is that of presenting a unitary vision of a proposed system's future. By creating a detailed scenario of use, there is a tendency to collapse the space of possibilities suggested by a design idea, curtailing a fuller exploration of its implications.

Few of our design proposals include detailed scenarios of their intended use. Instead, they indicate what a system might do and establish, often implicitly, the 'needs' it might address, usually without including details of how this would be achieved technically or accessed by an interface. In their reticence, they invite viewers to speculate about

these prospects themselves. It is not uncommon for people seeing our proposals—including, importantly, ourselves—to generate multiple stories of how the devices they describe might be used. These stories may include dystopian possibilities as well as positive ones (though rarely scenarios in which the devices are simply ignored), they may trace multiple, alternative paths, explore various technical and formal implementations, lead to suggestions for qualitatively different alternatives, and invoke different values (e.g. aesthetic or ethical) at different times. By avoiding the specification of detailed design scenarios, proposals can trigger speculation that opens the design space rather than closing it, which is often of great benefit in the early stages of design.

Creating Design Spaces

I have suggested that a single design proposal, when expressed with a requisite openness, can hint at a range of possibilities as it occasions people's speculation about the functions it might offer, how it might be realised, the circumstances in which it might be used, and the sorts of experiences and values it might serve. The power of design workbooks is in creating a much larger landscape for exploring such concerns by exploiting the combinatorial explosion of similarities and differences among many such proposals.

Consider, for instance, the Alternatives Workbooks described earlier [6]. The proposals they contained included two proposals for how information might be displayed in the home, a suggestion for an audio-only city guide that might lead you on unusual routes to your destination, a proposal for an artificially-intelligent birdfeeder that would train local songbirds to sing tunes of the user's choice, a device allowing people to influence their partners' dreams, another that would allow people to exercise their psionic powers, and one that would allow people to transmit their voices directly into space, whether as a form of electronically augmented prayer, or in an attempt to capture the attention of passing aliens.

Each of these proposals was potentially desirable and technically plausible, and indeed we later developed several of them further. Their real utility for the project, however, was in delineating a range of possibilities, technically, topically, and experientially, and in helping us to think about them ourselves and communicate them with our partners. For instance, the technologies they indicated ranged from displays and projectors to handheld devices, sensors, public displays, and so on. They simultaneously opened up a variety of technology we might consider, while implicitly suggesting that others, most notably those involving traditional arrangements of computers and monitors, were less interesting. In terms of topics, they brought into play issues of how information enters and is displayed in the home, how and why people navigate in the city, the importance of spirituality and non-traditional beliefs, our relationship with wildlife and each other, etc.

If the differences among the Alternatives pointed to a range of options for further investigation, equally important was what they had in common. Most fundamentally, all of the Alternatives proposals explored forms of engagement marked by curiosity, exploration and wonder rather than by the utilitarian pursuit of tasks. By presenting relatively concrete examples of technologies expressing such values, they simultaneously allowed the inductive definition of a genre of *design for ludic engagement* and provided a number of quasi-existence proofs that such an approach might be possible and interesting.

The notion of a 'design space' is a valuable metaphor for the way design workbooks can affect designers' perceptions of possibility. On the one hand, insofar as the similarities amongst the proposals they contain allow them to be seen as an integrated collection, workbooks pick out a particular configuration of concerns from amongst the vast range of possibilities open to design. On the other hand, their differences imply a kind of dimensionality that allows for other ideas—room to move around a central set of concerns and among the particular possibilities suggested by the proposals.

Of course, like any metaphor, the notion of a design space can be misleading. To begin with, variations among a reasonably sized set of proposals are not likely to reduce to a few dimensions, nor is it always useful, or even possible, to locate all proposals along all dimensions of contrast. One implication of this is that it is naive to think that simply looking in the 'spaces' between proposals can be a mechanism for generating new ideas. Instead, like a 'landscape' (rather than abstract Euclidian space), there may be areas that are impenetrable or uninhabitable. One of the challenges of design, from this perspective, is to identify the areas within a design space that can be successfully developed.

Design *creates* the spaces in which it operates. They do not pre-exist their manifestation, whether as undiscovered design ideas or as the abstract and rationalised parameter spaces that some of those who follow Simon [12] might suggest. Design workbooks are helpful in the process of elaborating a design space because in their multiplicity and simplicity they can allow the creation of a wide and complex territory relatively quickly, and in their provisionality they can invite the exploration of that space to discover particularly fertile areas within it.

In sum, constructing design workbooks can be valuable in turning from appreciating *what is* towards speculating about *what might be*. They ease the pressure of designing the 'right thing' [14], allowing designers to consider a range of external options and imagine how these might evolve, and to create and explore a space of designs before choosing to develop a particular option. In the next part of this paper, I describe another two design workbooks before turning to a discussion of the techniques for constructing proposals in this way.

TWO MORE WORKBOOKS

The Alternatives workbooks used a fairly limited set of techniques in their construction, largely involving collage, product visualisation and textual descriptions. In this section I describe a pair of more recent workbooks to illustrate a number of other techniques we have used in

developing design proposals, as material for a more detailed discussion of techniques to follow.

Equator Workbook 1

The second two workbooks were produced in the course of developing designs within the Equator Interdisciplinary Research Collaboration, which brought together seven UK university groups to explore how computational technologies can blur the boundaries between electronic and physical worlds in everyday life (www.equator.ac.uk/). Within Equator, our group focused on home technologies.

With such an open-ended brief, an integral part of developing specific designs was to decide for ourselves how to orient to the home, what sorts of topics and activities our designs might address, the overall perspective we might take in addressing those topics and values, and the technologies that might help us do so. We set the stage with a Domestic Probes study of London households [8], as well as through eclectic research into possible views on the home ranging from previous work in HCI, sociology and the arts to psychoanalytic accounts of the home, descriptions of the home as a hiding place for contraband, and popular news articles about unusual domestic activities.

As our research matured, we moved to a phase of developing sketch proposals for the home in an improvised, inspiration-driven manner. The four members of the design team developed the proposals relatively independently, with frequent informal discussions in the studio to share ideas and coordinate development. After several months of developing our ideas we grouped the proposals into categories in a post hoc fashion, and gathered them together in a workbook of about 50 more-or-less distinct proposals and related treatments printed in A4 landscape format.

The individual team members each had their own techniques and approaches for expressing design ideas, so proposals varied in their visual appearance and use of text (see Figure 3). An overall shared style did emerge, however. The images used a variety of resources: found imagery, diagrams, and computer-generated images that themselves ranged from the clearly hand-constructed (e.g. Sailor's Return on the bottom right of Figure 3) to the more impersonal (e.g. Product Wars in the bottom centre). Nonetheless, the overall graphical style of this workbook is more open than the second Alternatives workbook, with more white space and a lack of background images. In addition, the spreads are looser, often juxtaposing images to provide multiple views on an idea rather than presenting a single visual scenario.

The text of Equator Workbook 1 is also sparser than that of either Alternatives workbook. Many of the proposals include only a title and a line of explanation, with only a few using slightly longer explanations. For instance, the 'Sailor's Return' proposal shown on the bottom right of Figure 3 recounts a short narrative:

Gilbert comes home from sea and settles down to his first decent cup of his renowned Columbian coffee in 2 months. The neon sign outside the flat fizzles to life.

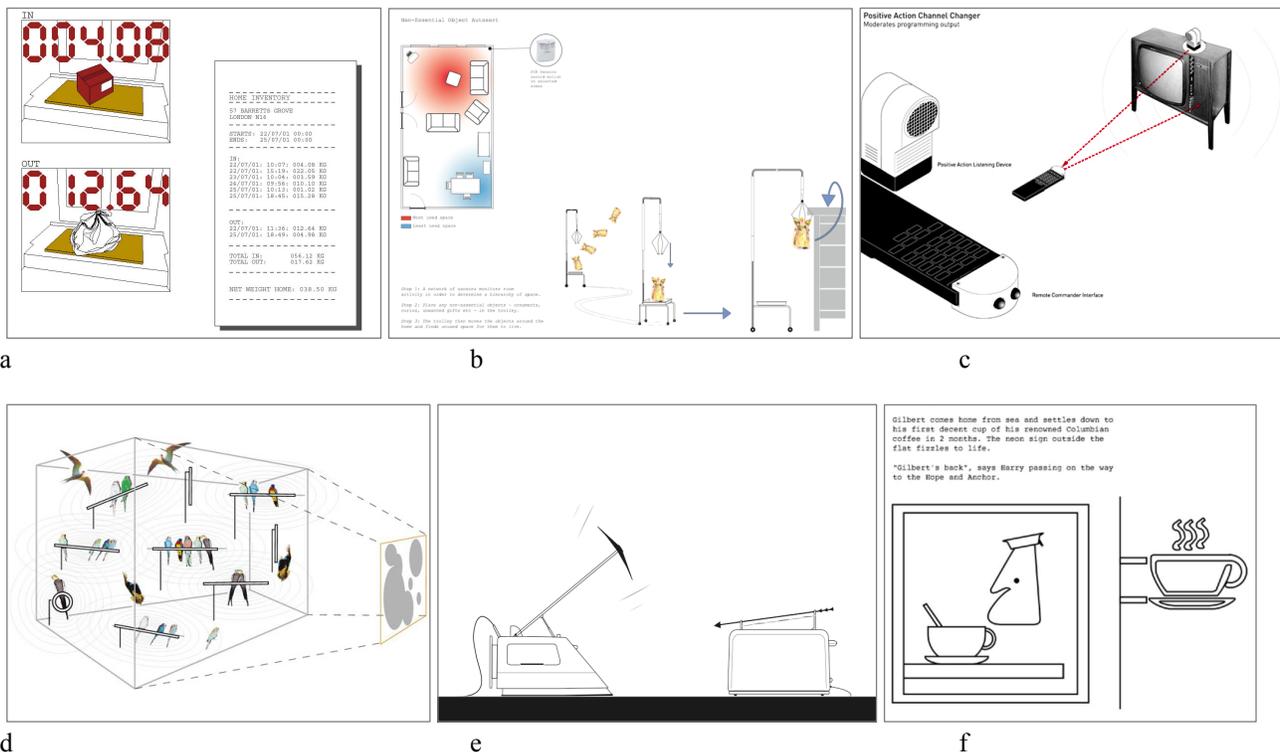*"Gilbert's back", says Harry passing on his way to the Hope and Anchor.*

Figure 3. Proposals from Equator Workbook 1.

The text here conveys the essential idea of the proposal both technically and in terms of its most obvious intended social impact with humour and economy. Other proposals are much drier descriptions that leave the sociocultural implications implicit. For instance, the text accompanying the 'Nonessential Object Autosort' proposal at the top centre of Figure 3 reads:

Step 1: A network of sensors monitors room activity in order to determine a hierarchy of space.

Step 2: Place any non-essential objects—ornaments, curios, unwanted gifts etc—in the trolley.

Step 3: The trolley then moves the objects around the home and finds unused space for them to live.

Finally, a number of proposals consisted only of a single image and title. For example, the proposal at the bottom centre of Figure 3 is simply entitled 'Object Wars.' Such proposals point to a possible issue to be developed or situation to be explored while leaving both technologies and sociocultural implications completely unspecified.

We produced Equator Workbook 1 as a resource for our in-house design work, but also to distribute to our partners from other universities to indicate the direction of our work, share ideas, and invite collaboration. One group reviewed the workbook page by page in a meeting, and later told us that their attention was particularly caught by a proposal that suggested measuring the "Net Weight of the Home" by recording the total mass of all items entering or leaving the premises, thus allowing inhabitants to track whether their home was gaining or losing weight over time. According to their accounts at the time, this inspired the group to investigate how to equip surfaces ranging from floors to shelves with load-sensors to enable tracking of objects upon them. Their research in this area in turn led our group to consider applications of load-tracking technologies, which led to our first tranche of prototypes produced in the project [5].

Equator Workbook 3
Several years were occupied in developing the designs and field trials that resulted from Equator Workbook 1. As this phase ended we started to consider the new directions our design research might take. We did not feel the need to undertake more research on homes, given how much we had learned from our original research and through the field trials of the prototypes we had developed. Instead, the task was to develop new perspectives and approaches that might be productive for our designs.

Once again, producing a workbook was an important stage in developing the ideas that eventually led to a set of new prototypes. Similarly to the first Equator workbook, this was produced over several months by the team working individually with occasional informal meetings to discuss progress. The workbook comprised about 40 pages in A5 portrait format, and was divided into four sections: 'Tracking Objects In The Home', 'Storage And Display: How Our Stuff Is Represented', 'Links To The Outside World', and 'Imaginary Extensions'.

Workbook 3 contrasts visually with Workbook 1 in using fewer diagrammatic treatments and including more contextualised images. More interesting for the sake of this discussion, however, is the way it mixes different presentations of ideas. Some of the pages (e.g., Figure 4a) describe project ideas as was done in the earlier workbook. Other pages, in contrast, explore more general issues. Figure 4b, for instance, highlights the proportion of space in our homes dedicated to storage. Others show images of artworks we found inspiring or directly suggestive of possible designs. Figure 4c, for example, shows Ilya Kabokov's 'Paradise Under the Ceiling', which suggests that inaccessibility may lead to a sense of wonder [9]. Still other treatments show illustrations of technical equipment that are suggestive without being directly relevant. For instance, 4d shows samples of movie-making equipment helpful in considering dramatic presentations of stored objects. Finally, some images showed results of our own design explorations. Figure 4e, for example, shows photographs taken of seldom-considered details of one of our homes. Similar mixtures of general considerations, artistic landmarks, external resources, experiments and proposals were used to explore a variety of topics.
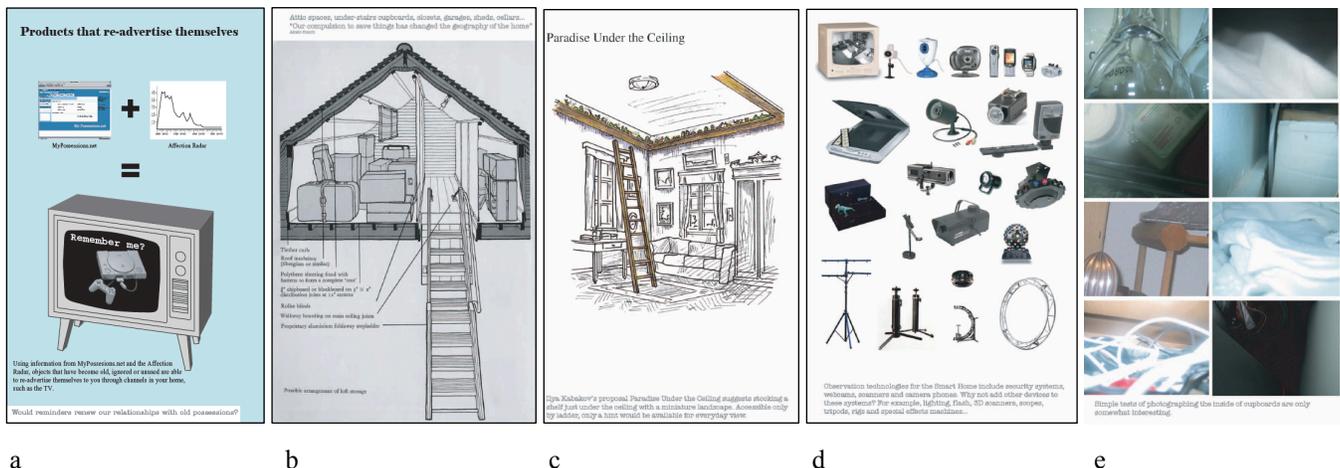

a   b   c   d   e

Figure 4. Pages from Equator Workbook 3.

Workbook 3 was again distributed to our project partners, but the primary intention in producing it was to advance our own design thinking. Over the following months, our development focused on one of the main themes of the workbook, having to do with the information thresholds of the home, culminating ultimately in the development of three deployed prototypes [7].

CONSTRUCTION TECHNIQUES
The four workbooks illustrate a range of techniques for constructing design proposals. In this section, I reflect on our practice, both to share methods that have been effective and, in particular, as a way of articulating the implicit intentions behind expressing ideas in particular ways.

Making Images
Few design proposals are described in words alone. Images are invaluable in expressing ideas for several reasons. They afford communicating an object's form or relationship with other components, as for example in Figure 3f. They allow a design to be appreciated both as an integrated whole and as a collection of more detailed parts, as in Figure 3c. Even if unable to fully convey complex ideas, images can serve as summaries or reminders, as in Figure 3d, or as shorthand representations of the basic issues, as in Figure 3e.

Images also tend to compel a degree of resolution about details of design ideas, which entails benefits and risks. This applies not only to the specification of functional aspects of a design, but also to the emotional or aesthetic tone it might convey. On the one hand, the specificity of images can be useful in encouraging consideration of aspects that might otherwise be left vague or overlooked altogether. In addition, the concreteness of images allows the ideas they represent to be approached as if they have an autonomous reality, independent from a particular imagination, which is useful in developing a disinterested stance towards them. However, their concreteness and detail can be dangerous in encouraging ideas to be treated as fixed, leading to designers becoming reluctant to explore alternative concepts or forms, or alternatively to objections to general ideas based on particular treatments. One of the aims in creating images for proposals, then, is to achieve a useful balance between resolution and indication, between actualising a design idea and leaving it open to change.

Collage and Found Images
Existing images can be a useful resource in constructing design proposals. They are appealing both for pragmatic and expressive reasons. On the one hand, they offer an appealing alternative to other forms of image creation insofar as they only require selection rather than creation (although a great deal of time may be spent finding and processing digital images, e.g. for use in collages). They can be used to imply that a proposed design might embody a similar form and scale, use similar materials, and perhaps involve similar technologies. In short, found images can sometimes be used as fairly literal representations of proposed designs.

More interesting, however, is the use of found imagery as indicative rather than representative. Images carry with them a host of information about materials, styles, kinds of people and places, aesthetics and cost that vivify them beyond their literal depiction of form and scale, and this can all be used to indicate features of proposed designs. The images used in Figure 1, for example, do not represent the intended appearance of an Objective View device, and it seems unlikely they would be interpreted as such. Instead,

Figure 5. The Prayer Device is represented by a collage.

features of the image may trigger associations that can inform further design. The corkscrew's ridged handle, for instance, might resemble a cloud, indicating that the camera is to be launched high overhead, while the curling blade might symbolise the radio waves that would beam an image to the waiting receiver/bowl, or perhaps look like flight lines tracing the device's trajectory. Perhaps the corkscrew as a whole looks like a thundercloud, symbol of the stormy moods in which the device is to be used. Or perhaps it simply looks like a relatively high-priced gewgaw. Thoughts such as these, transient, speculative, hardly attended to, may be elicited by found imagery without requiring explication or commitment; often, found images may be chosen simply for the unexpected, difficult to control connotations they carry.

Collages build upon the suggestive potential of found imagery. They can be used relatively directly as building blocks to construct new images, but equally their power can lie in the combination and contrast of different parts. This can complicate the set of associations they make available, but equally, it can simplify interpretation by reinforcing some elements and not others. The Prayer Device (Figure 5), from the second Alternatives workbook, is an example of a collage, designed to form a single coherent image, which works in these ways. It was constructed by joining an image of a snorkel to part of an image of a floorlamp, whose glass shade has been inverted. Used to visualise a device that would transmit one's voice to the heavens, the bowl suggests an upwards-facing transmitter (rather than a source of illumination) while the mouthpiece indicates not only a place that one might speak (rather than breathe), but that speaking would be a intimate and potentially uncomfortable affair.

Found imagery can also be a useful resource in suggesting new ideas for design. Collecting, juxtaposing and relabeling (c.f. [3]) existing images while attending to their connotations and associations can be a fruitful source of inspiration. On these occasions, constructing proposals can merge with ideation itself.

Diagrams and Renderings
Found images and collage can lead to richly evocative images, but finding appropriate images can be difficult, and the results can lead in undesirable directions. A more controlled technique for constructing proposals is to produce imagery directly, in the form of diagrams, drawings and renderings at various degrees of finish. Most of the proposals in Figure 3, from the first Equator

workbook, are constructed in this way. They range from the fairly literal renderings of the Positive Action Channel Changer shown in 3c, in which the televisions' audio signal would be monitored and the channel automatically changed in the case of inappropriate content, to the illustrations resembling cartoons (3e) or caricatures (3f).

The degree of detail of a diagram or rendering can be useful in indicating how developed a design is thought to be. Very simple, untextured, geometric renderings can give a basic indication of form and scale while clearly avoiding further commitment (e.g. 3d). However, detailed renderings are not necessarily to be taken as resolved. For instance, the Nonessential Object Autosort system shown in 3b indicates the functional requirements of a robot designed to stow 'non-essential' possessions using a fairly detailed, but highly improbable, image—the exaggeration here (as well as the title) clearly indicating that the idea needs developing. Similarly, the warring appliances in 3e are detailed but intended to illustrate a concept, not an actual design, a fact which their absurdity as well as their lack of texture and background all help to indicate.

Hybrid Images

Often diagrams and renderings are used with found images. For instance, a photograph of an existing setting may be overlaid with a diagram of a system to be designed, the different styles of imagery clearly distinguishing the real from the imaginary. The Placeholder proposal in Figure 2, for example combines a realistic backdrop with an image of a proposed device that itself combines collage with rendering. The simple block-and-clip picture-holder that represents the device's base simultaneously indicates its small size and simple form as well as the casual flexibility and perhaps low cost it is intended to have, while the rendered screen above is a more literal interpretation of the digital content it might display. Similarly, the untitled proposal in Figure 3d suggests that we might install sensors into a room, which one of our participants devoted to the keeping of about twenty birds, and use the resulting data to somehow visualise the birds' agitation as an indication of the household's overall well-being. The notional nature of this proposal is conveyed by the use of only the most diagrammatic indication of the room and display, while photographs of birds indicate that they, at least, are real.

Sketching

While reviewing our workbooks and proposals to develop this paper, I found that sketches (of the traditional, hand-generated sort) almost never appear within them. This is somewhat surprising given that in our studio we all actively sketch ideas throughout the design process as a way of visualising possibilities, working out problems, and communicating with one another—as writers such as Buxton [1] have pointed out, sketching is a fundamental technique through which designers think. In fact, many of our workbook pages are the result of a sketching process, in which we use sketches to develop both the design ideas and their presentation.

On reflection, there seems to be several reasons that we avoid reproducing sketches in our workbooks. First, they are too clearly authored to achieve the autonomy we require of them. Individual sketching styles are clearly identifiable, which makes merging proposals produced by different team members into an integrated collection difficult. In addition, traces of individual authorship may inhibit willingness to critique or suggest changes to the ideas they present, and this may be exacerbated when it is clear that a great deal of care has been put into their production. On the other hand, other methods of image generation also give evidence of the time taken to produce them, including the degree of conscious reflection about how to best represent an idea, that sketching may not indicate. Whereas sketches may be developed continuously from the first idea to the final drawing, other forms of production imply a pause for thought.

In sum, the lack of sketches in our notebooks reflects the properties we desire for the proposals they include. Design proposals should convey ideas as independent entities, able to be considered as separate from their authors and as part of an integrated collection. In addition, proposals should clearly have matured beyond their first conception, yet retain a requisite degree of provisionality to bring the ideas into play for speculation, development and inspiration of new ideas. In short, design workbooks are neither sketchbooks nor specifications, but in between the two, and the techniques used to create them reflect this.

Text

Images are almost always used to convey design proposals, but text usually plays a significant role as well. The balance between text and imagery in clarifying ideas can vary widely. Sometimes images serve to illustrate proposals explained largely through text, while in other examples text merely clarifies how to read an image. I describe these extremes separately to clarify the role that text plays and some of the writing techniques that are useful.

Text as Primary

In the Alternative workbooks, proposals relied on extensive text descriptions with images serving largely as illustrations to convey a sense of aesthetics and emotional tone. For example, the following text is from one of the proposals:

Intimate View

The objective nature of text, words, even video images is not only unsatisfactory for supporting distant love relationships, but even seems to interfere with the deeper, more subtle forms of interaction that create intimacy.

The Intimate View seeks to build a visual connection between lovers, but constrained so that shared perceptions, rather than visual facts, become the object. This is achieved by transmitting images from a tiny macro camera, or personal scanner, worn on the body.

By sharing only tightly focused portion of the local environment--the veins of a leaf, a drop of water, the corner of one's smile--the system would encourage partners to join together in a moment of highly focused mutual perception. Used playfully, aesthetically, or erotically, the device would permit rich new forms of loving communication to exist even over great distances.

Like most of the Alternatives proposals, this text takes the form of a short essay. The first paragraph sets out a perspective and identifies a problem from this point of view. The second conveys the proposal itself, in terms of a desired effect and how this might be accomplished technically. The third suggests the anticipated implications of the system.

These proposals may appear specific in the problems and solutions they describe, but they were intentionally written to be more ambiguous than they appear. For instance, they describe the technologies to be used in enough detail to seem plausible, but without over-specifying either a technical implementation or a particular interaction model. More fundamentally, important to the effect we tried to achieve was the tone we adopted in the writing. It is slightly over-earnest and yet deadpan, expressing a point of view clearly but without reflection or doubt. This adoption of an almost fictional voice—inspired in part by the artist Kabokov's [9] presentation of proposals as the inventions of fictional teachers, brick-layers and plumbers—appears effective in encouraging readers to approach the ideas from a critical remove, much as the exaggerated images described earlier invite scepticism.

Text as Subordinate

Many of our design proposals are expressed primarily through images, with text serving mainly to clarify them. Captions, titles and labels may be used with extreme economy to great effect. For example, the Positive Action Channel Changer is explained using merely the title, a subheading ('moderates programming output') and two labels ('Positive Action Listening Device' and 'Remote Commander Interface'). These four phrases, in conjunction with the images, serve to communicate the proposal adequately within the design team, and moreover, by echoing a phrase used by one of the Probe participants, give an indication of the kind of person for whom the device is intended, and the values it is meant to support.

Text is useful not only in explaining a proposed technology, but in setting its context and indicating the values that inform it. For example, the proposal for Products that Re-Advertise Themselves in Figure 4a contains a relatively lengthy description of how the system would operate, but also a simple caption: 'Would reminders renew our relations with old possessions?' that assumes a state of affairs (we neglect old possessions), a set of values (this neglect is undesirable) and a proposed solution (reminders), all in the form of a question inviting readers to think about their own position on the issues.

In addition, text can be used to transform material uncovered from background research into design proposals in their own right. For instance, a collection of movie-making equipment shown in Figure 4c becomes a proposal with the addition of a caption:

> Observation technologies for the Smart Home include security systems, webcams, scanners and camera phones. Why not add other devices to these systems? For example, lighting, flash, 3D scanners, scopes, tripods, rigs and special effects machines.

Used in this way, simple captions can invite readers to extrapolate beyond the material included in a design proposal. Rather than pointing to a reified idea, proposals like these establish a starting point for further speculation, serving as seeds for further design work.

DISCUSSION

The different forms proposals take—the images and text used to construct them—can convey a great deal of information about their nuances and the ways they are to be approached. Humour, for instance, can open an idea for play without undermining the insight it suggests (e.g. Figures 3b, e and f). Nonetheless, design workbooks also depend crucially on a community of practice that informs their interpretation and use. Many of the images and captions used in our proposals gain meaning within our team because they recall previous projects, conversations with volunteers, art and design work with which we are familiar, and cultural references that we share. Much as a conversation among old friends may be difficult for an outsider to comprehend, many of our proposals require explanation when used to communicate with project partners or the audiences for our design.

Constructing design workbooks to rely on our community of practice has advantages, however. Most fundamentally, we share an understanding that everything in a design workbook should be addressed as a proposal: that is, as indicating a direction and course of action for design. Increasingly, this applies to materials that we include in our workbooks that do not appear to be proposals at all. For example, the cut-away view of a house's storage spaces in Figure 4b points to a direction for design to address the amount of 'dead space' this represents. The image of Kabakov's 'Paradise Under the Ceiling', in 4C, suggests finding ways to revivify stored possessions as objects of rarity and wonder. Finally, the movie-making equipment in 4D, and the snapshots of disused spaces in one of our homes in 4E, both serve as explorations of how this might be achieved. These implications and connections are only hinted at by the images and text of the workbook itself; it is our established understanding of the role and purpose of workbooks that allows us to use them as they are intended.

Design workbooks, in our group, also express and depend on an underlying methodological approach that stresses the importance of initial design explorations. Workbooks such as the ones described here often take weeks or months to construct. They defy the assumptions of brainstorming sessions as traditionally understood, in which valuable design ideas are thought to emerge from quick, uncritical sessions of free association. Instead, they reflect the labour and care we feel necessary to establish new design spaces successfully. At the same time, the workbooks we produce often contain dozens of proposals and treatments, the vast majority of which will not be developed. By serving as archives of a thought process that may extend over a long period, sketchbooks ensure that we do not discard unused ideas, but may return to them years later. Most fundamentally, then, the workbooks, and our profligacy with ideas, reflects the fact that what we value in the

process is not just the specific ideas themselves, but the space of opportunities to which they give access.

There can be problems in developing workbooks, of course. They are time-consuming to develop, and it can be seductive to over-produce them—that is, to craft their appearance beyond what is necessary to explore and convey a set of ideas. The proposals shown here were largely developed by experienced designers, but as Figure 1 indicates, they can also be realised effectively in a more amateurish style. In addition, workbooks are printed documents, which has several advantages (portability, ease of annotation, the ability to control formality) but means that representing dynamic interactions can be difficult (though indications are still possible). Finally, the mix of resolution, openness and provisionality that makes the workbooks effective within our established design culture can make them confusing for outsiders. These potential pitfalls need to be negotiated as projects develop.

More importantly, my description of developing myriads of proposals over long periods of time may make them appear unsuitable for commercial practice. This reflects our use of workbooks at the outset of open-ended research through design projects, when it is important to access a broad design space for investigation. In a commercial setting, however, such workbooks, developed across several projects, could be useful in establishing an ongoing sense of group identity, direction and style. We have also developed workbooks at later stages of projects, moreover, and for communicating ideas to participants and collaborators. Having already focused on a direction for design, our proposals tend to be fewer and more detailed, and the production time shorter, making these workbooks more similar to those that might be developed within commercial projects. Even in these more constrained situations, the commitment to multiplicity and provisionality the workbooks embody is useful in avoiding commitment to the first idea that seems feasible: workbooks still work to encourage exploration of rich and non-obvious spaces of opportunity.

ACKNOWLEDGEMENTS

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