Chapter 14. Observation and Ideation

Technology is just another part of society, and the markets for new technologies sometimes seem like a convoluted dance of intentions, reactions, and unexpected consequences. Apple Computer sent thousands of unused Lisa computers to a garbage dump in 1989 because they could not sell them (Hall, 1999). In 1994 Nokia sold 50 times as many of their model 2100 handset than they had predicted, which caught them by surprise (Ravasi and Lojacono, 2005).

Because markets are complex and people are unpredictable, it is tempting to say that developers should focus on technology because it is easier to understand. This decision, which may seem like a safe focus on "core competencies," is actually quite risky. It leads to a technology creation approach where engineers first "invent," and marketers look for "applications" for these so-called inventions later. This invent-in-isolation approach defers any inquiry into what people might find valuable and interesting about an invention to a time when there is little ability or will to make big changes to actually meet those needs. The product's success then depends on whether initial assumptions match what people want, what people are willing to accept, what the technology can do, etc. If any of those assumptions is off, and if post-production marketing cannot overcome them, the project risks joining the warehouses full of failed gadgets destined for discount sales, recycling, or the dump. Products made with embedded information processing are particularly vulnerable because they mix novel services, specialized hardware, and new interaction design.

It does not have to be this way. Observation techniques can identify what people are interested in, what technologies they are willing to accept, and the role those technologies can play in their lives. Ideation techniques can define what a technology (or a combination of technologies) does well and how it can satisfy people's needs.

Combined, the two approaches constitute a tactical risk management approach that uses constraints derived from direct observation to generate novel design ideas.

14.1. Observation

Note: For a broader discussion of user experience research techniques, please see Jones and Marsden (2006) and Kuniavsky (2003).

The novelty of ubicomp technologies and their attendant social changes requires an especially close examination of people's attitudes and desires. Simply watching people is a key way to know what to emphasize when designing technologies for them.

There are many techniques for observing how people experience technology. Many can apply to any technological experience, not just digital products. House keys, scalpels, and forklifts all create user experiences that can be observed. This chapter presents several that are particularly useful for mobile/ubicomp user experience design, but the details matter less than the overall philosophy: the more you watch people, ask them questions, and analyze their behavior, the more attuned you can make the experiences you design to *their* ways of experiencing the world.

14.1.1. A basic observation method

The simplest observational technique is unstructured extended observation, what Agar (1996) described as being a professional stranger. This is the core of most professional observation techniques. Everyone from anthropologists and journalists to police detectives uses unstructured observation. It is the first step when trying to determine what is really going on in an unfamiliar environment. At its most basic, it can be summarized as "pick a spot, hang out there for a while, watch carefully." Those commands can be formalized into an eight-step process: [1]

1. Define the scope of the observation

2. Pick an audience

3. Observe for an extended period

4. Document observations

5. Interview representatives

6. Organize observations

7. Identify patterns

8. Make recommendations

[1]This specific description owes a lot to Beyer and Holtzblatt's contextual inquiry (1998), a highly structured method explicitly created for technology design.

This technique has become the core of a practice called *design ethnography* ([Salvador et al., 1999](#)). [2]

[2]For an excellent introduction to design ethnography methods, see [Chapter 5](#) in [Jones and Marsden (2006)](#).

14.1.1.1. Define the Scope

Although any given project will produce many interesting observations, only a small subset of them will directly address the goals of the project. Defining the questions a research program will try to answer is key to making sense of the observations. Answering these questions defines the scope of the research. Is the goal to validate assumptions behind a preferred design or technology solution? Is it to generate ideas for new products? Is it to understand why an existing product is not as successful as had been expected?

14.1.1.2. Pick an Audience

Similarly, describing a product's audience answers many design questions before observation even starts. If, for example, a product is used in a hospital, is it primarily going to be used by doctors, nurses, or support staff? Each group has different responsibilities, different behavior patterns, and different relationships to the wide range of technologies used in hospitals. A product for all three groups would have to cover the entire range of activities at the hospital. Few products have such general utility, so although it would be nice if everyone at the hospital used the product, odds are that it is going to be used by one of the groups significantly more than the others. That group, then, is the primary target audience. It should be the focus of observation. If the product proves successful with one audience, its functionality can be broadened to secondary audiences. But it has to work for *someone* before it can work for everyone.

14.1.1.3. Observe

In field observation, an observer finds a location where she can observe the target audience without significantly interfering with activities. After getting permission[3] to observe the people in that location, the observer watches, trying not to make assumptions about what she is seeing. This is notoriously harder than it sounds. The duration of the observation depends on the

complexity of the situation under study, the novelty of the planned intervention, and the familiarity of the observer with the domain under observation. For a researcher from a large corporation, a day's observation of office workers in a similar corporation in the same city may be sufficient. On the other hand, an urban researcher may have to spend several weeks over the course of six months to get even a basic understanding of who does what, where, and why on a farm in a foreign country.

3What constitutes permission varies greatly with the location. In a public space in the United States, getting permission to watch people is probably not required. In other countries, you may need to ask permission if you are taking photographs. If there is any doubt about the rules for doing research in public spaces, check national laws and ask locals about how they do things. Formal permission in an office could require only a memo from an executive. Obtaining permission to be in a hospital or factory can be quite involved because of liability, privacy, and intellectual property issues.

A powerful close observation approach for design is the master/apprentice model (Beyer and Holtzblatt, 1998). An observer acts as an apprentice, treating the person observed as the master craftsman. The observer watches the master do his work and occasionally asks questions. The master describes what he is doing while doing it. This keeps the "master craftsman" focused on details and avoids the generalizations. Retrospective narratives often lead to generalizations from glossing over key details that seem so obvious to the person doing the work that they go unmentioned.

14.1.1.4. Document

In *Blow-Up*, Michelangelo Antonioni's 1966 film, a photographer uncovers a murder by making increasingly larger prints of a photographic negative. Similarly, examining documentation from field observation regularly reveals surprising details. 4 For example, when examining photographs from an observational session at a hospital, a researcher noticed that a doctor was wearing two pagers. Why two pagers? Questions from follow-up interviews revealed an important use of this basic hospital technology. One pager represented each doctor as an individual, and the other represented the doctor's role during the current shift. Thus, when a woman arrived at the hospital in labor, her nurses would call the role pager for "the obstetrician on duty" knowing that some qualified doctor would reply to it. However, if Dr. C's own patient experienced complications, then she would get a page on her personal pager. During shift changes, doctors passed role pagers as a kind of badge that signified the shift of responsibility. At the same time, their personal pagers stayed free from calls that were not directed to them personally.

4Although, hopefully, no murders.

Documentation typically includes written notes, photos, and video. Notes should be as detailed as necessary to help reconstruct the action later, without impeding the observer taking in as much of what is happening as possible. When forced to choose between observing and documenting, observing always wins. Whenever possible, try to clearly differentiate between the concrete things you can see, and what you believe those things *mean*. The latter almost always indicates the presences of assumptions that may or may not be justified.

Wasson (2000) recommended dividing observations into five categories, mnemonically organized in the order of English vowels:

- Activities. What are people doing?

- Environments. Where is it happening?

- Interactions. How are people doing it?

- Objects. What artifacts are they using?

- Users. Who are they?

Film language provides a guide for what to visually record:

- Establishing shots record the broad environment in which the action happens.

- One or two people dominating a frame are a medium shot, focusing on how they interact. A medium shot captures details about people, their relationships, and what they are wearing and carrying.

- Close-ups show important details in the story.

The combination of text and visual documentation is a rich source of material for insight into people's relationship with technology and inspiration for new products and services.

14.1.1.5. Interview

Observation describes what happened, but interviews help determine why it happened. Interviewing members of the target audience is necessary to understand how they understand what they are doing with technology and why. People's descriptions of what they do and how they do it are fallible (which is why surveys about preferences and future behavior often do not predict actual future behavior), but personal narratives help explain behavior and technology use.

Interviews can be structured and unstructured. In structured interviews every interview consists of standardized lists of questions. Answers to these questions can be directly compared between interviews. In unstructured interviews, the interviewer asks whatever questions seem appropriate at the time, following discussion threads and examining certain ideas in more detail than others. In practice, nearly every interview combines prewritten and improvised questions (a semi-structured interview). Interviews should also be non-directed, which means that the interviewer should try not to influence the interviewees' responses.

14.1.1.6. Organize

Once all of these data are collected, the researchers and designers need to make sense of it. Organizing observations through coding (the process of assigning short tags to individual observations) is a typical, although somewhat time-consuming, first step in design research. 5 The basic steps in coding are:

- Identify atomic units of observation. Typically single statements in a list of notes, individual photographs, and "interesting" video segments.

- Create a list of codes. This is often done by going through observations and creating new codes until most observations fit an existing code. Several people can do this and then compare their lists of codes to see if there is general agreement on how to group observations.

- Code all observations, entering observations and codes into a spreadsheet or database.

- Sort to identify clusters of similar observations and extract underlying unifying qualities among them.

5Young (2006) documented a similar, but much more detailed, method for analyzing people's descriptions of their behavior and used that analysis to identify their information and navigation needs.

This method creates a way to organize observations so that patterns can be identified and documented. Constructing *affinity diagrams* (Beyer and Holtzblatt, 1998) is another popular analysis method. In this method, analysts write individual observations on Post-It notes, organize the notes into clusters, label the clusters, and sequence the clusters to create a model of what has been observed. As the diagrams grow, researchers can find patterns in the proximity and distance of the notes.

14.1.1.7. Identify

Identifying the tools people use and the patterns in which they use them creates insight into the role that new technologies can play in the given context. Someone takes a coffee break at the same time every day. Someone else reads on the phone during the morning train commute. Another person is making a playlist as a gift. And that person's spouse is printing a map of public bathrooms with baby changing tables in midtown Manhattan.

The basic user experience pattern identification method is to cluster data, then examine the clusters for recurrent themes and inspirational edge cases. The first group identifies common behaviors, places, and times where technology can intervene to help make things easier, better, more entertaining, etc. The second group showcases unusual, evocative possibilities that provide rich avenues for exploration.

14.1.1.8. Recommend

Weeks or months of observations are wasted unless you can mold them into forms that succinctly, yet richly, communicate the salient aspects of your users' lives.

Jones and Marsden (2006)

Finally, every observation project needs to provide concrete value for technology development teams through specific recommendations. Because it takes complex social behavior and turns it into a set of design constraints, the process of creating design recommendations cannot be purely objective (Dourish, 2006). However, at its best it presents a grounded analysis that links specific design decisions to actual behavior.

What observers choose to report and how they choose to report it depends on the goals of the project, the company, and (frequently) the observer. Because analysis introduces bias, it is the observer's responsibility to present observations in the clearest way, even if it shows that positions previously advocated for, or hoped for, are wrong.

In one approach, analysts present a range of possible actions, describing possible implications of each one, and let the developers explicitly choose a path. This reflects the fundamental uncertainty of reducing complex attitudes and behaviors to a short list while still providing specific guidance so that the project can move on.

Sidebar: Ethnography vs. Design Ethnography

Despite the confusing name, it is important to distinguish design ethnography from the traditional ethnography practiced by social scientists. Their work emerges from engagement

with other ethnographic texts and theories. Traditional ethnography is an intensive process that attempts to paint a deep and rich picture of the lives of a group of people. Ethnographers observe people across contexts (in their homes, at work, at play, etc.) to describe their lives as a whole.

Design ethnography rarely aims so high. Instead it tries to generate insight about the behavior and attitudes of people in specific situations with the goal of creating products and services. Where ethnographers observe to generate theories about entire cultures, design ethnographers conduct fieldwork to develop the next generation of a product. For an elegant discussion of the history and differences between the two kinds of ethnography, see Paay (2008).

14.1.2. Specific methods

This section highlights several observation practices that elaborate on this general approach, but there are many more.

14.1.2.1. Digital Ethnography and Public Photos

Thanks to the rise of social networking Web sites and photo and video sharing services, many people publicly describe and document themselves and their lives in great detail. Using Internet tools to gain insight into people's lives is a significant part of digital ethnography (Masten and Plowman, 2003).[6] In solicited digital ethnography, researchers recruit people to use digital means to describe their life. The methods used can range from asking people to send e-mail updates to asking them to respond to questions and record their lives using tools such as digital cameras, mobile phones, social networks, wikis, etc. Unsolicited digital ethnography is the analysis of how people describe themselves digitally without being part of a research project. This can include analyzing blogs, videos, photos, and forums to extract an understanding of people's behavior based on how they have documented it.[7]

[6]This term was widely popularized in the wake of cultural anthropologist Michael Wesch's YouTube video "The Machine is Using Us," created by his Digital Ethnography class at Kansas University in 2007.

[7]A particularly eye-opening example is Sharpe and Earle (2003), who analyzed the comments on a Web site where prostitutes' customers rated their service providers.

It is relatively simple to search for photos and videos tagged with specific keywords on Flickr, YouTube, and Photobucket. These provide a rich source of documentation of people's lives, and how they use technologies.

For example, the Flickr "what's in your bag" photo pool[8] contains thousands of pictures of what people carry with them every day (Figure 14-1). The metadata around the items, the photographers' other images, and the images taken by their friends give insight about their lives (see Sidebar: Image Search Tips).

> ### Sidebar: Image Search Tips
> People rarely use the same terms that designers use to describe what they have photographed. Until image indexing technologies understand the content of images, the tags associated with an image will be those put there by the photographer. Choosing keywords to get at the right kinds of images is more of an art than a science, but several approaches can help uncover interesting photos:
>
> - Search from the perspective of the photographer. For example, searching for specific brand names ("Nokia," "Sony," etc.) can generate results when category names ("mobile phone") cannot. When searching for pictures of older women, search for "mom", "mum," or

"mama," rather than "older woman."[9]

9Thanks to Elizabeth S. Goodman for this technique.

▪ Examine the photo pools (in Flickr terminology) or photo groups that an appropriate photo belongs to in order to find more photos of a similar type.

▪ Note what other tags or descriptive words photographers use and search for those.

8http://www.flickr.com/groups/whats_in_your_bag/pool/.

Figure 14-1

What was in blu_pineappl3's bag on April 26, 2008?
(Photo by blu_pineappl3, licensed under Creative Commons Attribution 2.0, found on Flickr)

The downside of this technique is that unless solicited or followed up on, the images come without context. The photographers present themselves and their world in a specific way, to a specific imagined audience. They do not show their whole life, just the parts they think their audience will appreciate. Often, it is difficult to know the exact relationship between the people, objects, and technology in the photos. (However, since most of these sites have ways of contacting the person who posted a photo, it is possible to ask them to explain it over e-mail). Further, the technique is limited to people who have access to the Internet, can use photo/video-sharing sites, and are interested in doing so.

However, as an observation method that can be done without leaving your office, looking at photographs online is hard to beat.

14.1.2.2. Diary Studies
Reporting on a single, recent behavior, or getting a first-time impression of a proposed solution is useful, but it does not represent how people actually live with technology. Relationships with a technology — or with the lack of one — change over days, weeks, and months. Something that

seems trivial on first inspection, like a map that can automatically detect the current location, may become indispensable. Conversely, something that seems valuable on first glance (such as getting text messages whenever friends update their Facebook status, for example) can become tedious or uninteresting with repeated exposure.

As ubiquitous computing devices are largely novel, it is difficult for researchers and for potential users to predict the long-term value of any given technology. An idea that sounds uninteresting as a concept may be embraced when actually experienced (the Nintendo Wii's popularity with senior citizens, for example). On the other hand, descriptions of the Segway scooter sounded exciting and futuristic, but the actual adoption rate was quite low.

Diary studies are a solicited method for getting insight into long-term use. The general technique consists of regularly prompting a group of volunteers to describe their experiences. Diary studies can either examine people's use of technology (say, a new phone) or their experience with a problem that the technology is trying to solve (for example, managing caloric intake while eating out).

A common diary study method gives participants a simple questionnaire to fill out on a regular basis. The questions can be about people's attitudes toward a task they do, a technology they use, or a log of their behavior. Participants can complete diary entries daily or weekly, prompted by an e-mail or text message, or a specific event can trigger them. Researchers can ask participants to take photographs and videos, and save artifacts, in addition to filling out questionnaires. The technique is very flexible.

For example, Colbert (2008) described a diary study where participants documented plans they made to meet in a specific location with others. The participants were encouraged to fill out a questionnaire soon after they made plans with someone else. Such structured diary studies are typically easier for participants to fill out than unstructured ones, although they provide less opportunity for unexpected information and need to be worded to not lead the participants to answer one way versus another. Yet another variant is experience sampling, [10] in which participants answer questions whenever given a specific signal. Traditional experience sampling is conducted using a pager to signal that it is time to fill out a paper form, but such research can be now be conducted using forms sent as e-mail messages to mobile phones or through instant messaging.

[10]Csikszentmihalyi and Larson (1987) originally developed experience sampling (or ESM) for social research in the 1970s. Design ethnographers adopted it in the 1990s and 2000s. See Consolvo and Walker (2003) for a ubiquitous computing-specific interpretation.

Diary studies can also involve in-person interviews where the participant can review individual entries with a researcher and provide context and background. A typical sequence of these can be:

• An initial interview, where the researcher explains the structure and purpose of the project and gets background on the research participant.

• An in-process interview, where the participant and researcher discuss specific diary entries and adjust the process as necessary.

• A concluding interview, where the two review the project and the results. If the research is investigating the technology, this is an opportunity to get the perceptions of the participants about the technology, how those perceptions changed, and how they compare to actual behavior.

> *The core of the probes approach is to give people (possible future users) tools to document, reflect on and express their thoughts on environments and actions.*

> *Hulkko et al. (2004)*

The design probe is a relatively new technique to help designers understand people's experience and to inspire new design approaches. Like a diary study, probes give people devices or activities to perform and document their experience over extended periods. Unlike a diary study, the technique encourages unexpected, poetic, and interpretive responses to highlight or exaggerate attitudes or behaviors that people would otherwise not document.

Cultural probes (Gaver et al., 1999) are used to help designers form interpretive responses to people's lives without observing them directly like a diary study would. These probes consist of packs of evocative materials. The packs can include cameras, workbooks with exercises for participants to use when exploring ideas, colored pencils and markers, online social networks, etc. These are coupled with open-ended activities that can be delivered as postcards (Roibás and Johnson, 2008) or mobile phone messages (Hulkko et al., 2004). These activities can be straightforward documentation exercises or they can be deliberately ambiguous tasks that force participants to think about their lives in unfamiliar terms. Participant responses, which may be just as ambiguous as the questions, then force the analysts to rethink their own expectations.

Thus, Roibás and Johnson (2008), in a study for a phone company, asked participants to photograph things or events they would like to photograph with their phone and then to draw a map of their house, marking on it where they like to be alone and where they like to meet people. To understand what participants wanted in house cleaning technology, Wyche (2004) asked participants to write a help wanted ad describing the skills they would want in a cleaning person. To understand how technology communicates intimacy, Vetere et al. (2005) asked couples to keep scrapbooks documenting their communications, noting emotion and completing evocative phrases ("I misunderstand my partner when..."), which were delivered as stickers.

Technology probes (Hutchinson et al., 2003) try to understand people's relationships to technologies by using partially functional, sometimes whimsical devices to explore people's relationships with and attitudes to certain kinds of technologies. For example, one project proposed installing a robot to weed small gardens and send photos of flowers and plants to the garden owner. [11] How would different kinds of gardeners react to that? The goal is not to evaluate the desirability of robotic weeding technology — it is unlikely to exist for domestic use for many years — but to understand a gardener's relationship to the idea of automation. Most gardeners are comfortable with taking phone calls in their garden and participating in online garden forums, but what are the limits of technologies in relationship to home gardening? A probe that sits outside of expected uses of technologies in gardens creates a point of discussion for identifying what the expected uses are.

[11]Thanks to Elizabeth S. Goodman for this example.

14.2. Ideation

Technologies are created, not discovered. Nor is innovation just identifying unmet needs in a target audience's life. Despite the popular rhetoric about "discovering" needs, some needs do not exist until a product creates them. For example, people likely did not buy white carpets before vacuum cleaners created the opportunity for the emergence of a new desire (Cowan, 1983).

Design changes technologies and it changes people. Every new product design does two things: it extends the capabilities of devices and it shifts people's expectations for what is possible and valuable. Designs based solely on observations carry with them the assumption that the future will look a lot like the past, which is only partly true. The past is important, but backward-facing design rarely succeeds in creating long-term change and provides little information about replicating unexpected successes or avoiding unexpected failures.

To alter expectations of what is possible and desirable requires understanding why certain design choices were made. To justify choices requires defining a design space, exploring it thoroughly, and documenting the exploration. Ideation is a way to develop and test design hypotheses about technologies and people in a controlled way.

For example, the "Vision of the Future" project by Philips Design in 1995 (Baxter et al., 1998) generated 300 different product use scenarios, extensively prototyped 60, and created short films for each showing how Philips envisioned people using them. None of the prototypes became products, but the process defined the Philips approach to consumer product design for more than a decade.

Of course "generating new ideas" and "exploring a design space" are easier said than done. Fortunately, creativity is not magic, especially in user experience design. There are many effective idea generation methods, ranging from brainstorming and mood boards to decks of specialized cards[12] and innovation games. Several emerging techniques useful to ubicomp user experience design come from outside of the standard industrial design and creativity and problem-solving[13] toolkits. These next techniques are adapted from a variety of fields and represent the rich variety of approaches for generating and documenting many design ideas in a short period.

[12]IDEO's Method Cards (ISBN 0954413210) are probably the best known, but the practice goes back to at least Eno and Schmidt (1975).

[13]See Michalko (2006) or de Bono (1999) for many more examples of general approaches to creative problem solving.

14.2.1. Extrapolation

Extrapolating current trends is a popular scenario planning[14] method. Scenario planning typically selects issues from four classes — political, economic, social and technological[15]— to see how changes in any of them affect a company or a product line, creating new challenges or opportunities. Similarly, extrapolating from identified trends generates new design ideas and insights.

[14]See Schwartz (1996), Pillkahn (2008) and Wilson and Ralston (2006) for more detailed descriptions of scenario planning.

[15]Often collectively referred to as PEST, presumably to be swatted with SWOT — strength, weakness, opportunity, threat — analysis.

14.2.1.1. Extrapolation Across Demographic Groups

Differences in income, employment, location, and age are broad indicators of differences in relationships to technology. By imagining what would happen if a technology designed by one demographic was adopted by another, it is possible to generate ideas about how that technology can be useful in unexpected places and how it would have to change to be valuable to new markets.

For example, someone who grows up as a digital native (Prensky, 2001), sharing personal information on the Internet with friends, schoolmates, and strangers, might have a different

attitude about sharing personal information as an adult. As this person moves into the working world, expectations for self-presentation through digital devices in a business context may be quite different from previous generations' expectations when compared to the expectations of someone who did not grow up sharing on a social network. What does this mean for how the digital native would use other technological devices? What does it mean for the non-native in a workplace of natives? Each of these questions can generate a response in the form of a product or service design, or many designs.

Virtually any relevant demographic data[16] can be used as a starting point for ideation based on demographic extrapolation. For example, a survey (PriceGrabber.com, 2009) reported that 53% of North American respondents who own Web-enabled phones said they bought their first one in the previous two years. These statistics point out that most people who can access the Internet through their phones have only been aware of it, or had the capability, for two years at most.

[16]Pillkahn (2008) has a good list of public sources in Appendix I.

What will happen after these people have been knowingly using Web-enabled phones for five years? Many European countries reached these levels several years before the United States. How is this reflected in their attitude toward devices? Can that be mapped to American users?

14.2.1.2. Extrapolation Between Domains

Colorful, affordable, available at malls and simple to operate, beepers are hip accouterments among the young. Marketers say people 35 or younger account for up to 80% of retail pager sales, a booming business that barely existed before 1991.

David Dishneau, LA Times, June 30, 1994

Mapping documented behavior with one technology to another is another source of design idea creation.

Such forecasting by analogy requires finding a well-documented technology or behavior, then imagining replacing the technology or behavior with an analogous, hypothetical one and working through the differences and similarities. For example, as mobile phones grew in popularity, manufacturers could have looked at pagers as a model of who would buy them, when, why, and how they would use them. Even a simplistic model ("mobile phone adoption will be exactly like pager adoption") could have been sufficient to generate a range of design directions for phones and phone services. For example, colorful Motorola pagers became a fashion hit in the early 1990s, but it took until the late 1990s for Nokia to introduce their first mobile phone in a choice of colors. [17] That delay could have been intentional, or it is possible that Nokia's designers did not look at the pattern of pager adoption (first as niche tool, then as consumer electronic, then as fashion item) and project that mobile phones would quickly become fashion objects.

[17]With the Nokia 252, introduced in the fall of 1997 in the United States (Nokia, 1997).

Today, we might compare house media servers to other home appliances and extrapolate based on the adoption and use of those devices. Home media servers share certain characteristics with automatic espresso machines, DVD storage racks, garage door openers, trash compactors, water purifiers, and closet organizers. What can be learned about media server design by examining people's attitudes toward those devices and how each of those devices is used?

14.2.1.3. Extrapolation by Orders of Magnitude
A digital device that is expensive and rare today is likely to be cheaper and more common at some point in the foreseeable future. Extrapolating from current use leads to insights about

device adoption. One simple way to generate ideas about how a technology could be used is to multiply its prevalence by one or two orders of magnitude or to divide its price by similar amounts.

In other words, multiply the prevalence of any given technology by ten, or pretend it costs one tenth as much. How would that affect how people use it? What if there were ten times as many glowing screens in every room as there are today? A hundred? This was the question that led Appliance Studio to the development of RoomWizard (Chapter 11).

What if a relatively expensive technology today, such as bright digital video projectors, was 10% the price it is today? What if it was 1%?

14.2.2. New ideation tools

Traditional ideation methods either rely on a single person told to make up "a bunch of ideas," on small groups formed for one-day brainstorming sessions, or on consultants hired to do the same. Although any method can lead to innovative ideas, all the traditional methods have significant limitations. The following techniques use collective distributed labor and the talents of an entire team to create unexpected and inexpensive sources of inspiration that come from a wide group of people.

14.2.2.1. Crowdsourcing

People are creative and like interesting challenges. Many of them spend days in cubicles or at home out of necessity. Crowdsourcing (Howe, 2006) uses their available time, Net connectivity, and collective ingenuity to perform work that only people can perform. Using Amazon's Mechanical Turk, a generalized platform for crowdsourcing work in exchange for small amounts of money per task, an ideation technique could work like this: [18]

1. Invite people to generate ideas using a fixed set of criteria.

2. Generate hundreds or thousands of ideas.

3. Invite other people to evaluate the quality of the ideas generated by the people in the first group. Use multiple people to evaluate each idea (or set of ideas) and average the results.

4. Use the highest rated ideas as seeds for further ideation in-house.

[18]Amazon's Mechanical Turk is a general crowdsourcing platform, but crowdsourcing models also exist for specific design processes. For graphic design, for example, there are (as of spring 2010) companies like 99designs and crowdSPRING; Quirky is a crowdsourced product development platform and Kickstarter is a crowdsourced funding company. By the time you read this, entire crowdsourced product development economies may have sprung up based on tools that get participants to generate, evaluate, design, fund, manufacture, market, sell, and buy products. Or not. It could just be a fad.

Because Mechanical Turk costs so little per task, it is possible to generate hundreds or thousands of ideas on a given topic for relatively little money. But the challenge is to generate good ideas. As Krieger (2009) documented, unrestricted public ideation can lead to chaos. His project to generate ideas using Mechanical Turk for technologies "to promote healthy eating"[19] was built on a significant amount of research into what had caused other crowdsourced projects to fail. Villarroel and Tucci (2009) determined that most people participating in Mechanical Turk were doing it equally for fun and money. Thus, effective crowdsourced ideation requires balancing fun and money, while maintaining structure and effective evaluation mechanisms.

14.2.2.2. Bodystorming

Acting out scenarios can suggest opportunities or reveal problems that would not be obvious when "brainstorming" in a studio, office, or lab. In shopping malls, urban streets, parks, schoolrooms, etc., designers can observe people directly, create prototype responses, and talk to prospective audience members to gauge their reactions to the ideas. Placing developers bodily into situations where the products of their work will be used lets everyone use all their senses to understand the context for which they are developing.

14.2.3. Observation and ideation as risk management

It is one thing to recognise that an innovation progresses by means of decisions, some of which are occasionally implicit; it is another to maintain, as we have started to do, that these decisions are made in the middle of uncertainties amongst which it is practically impossible for a sure case to be guaranteed. Such is the paradox which should never be forgotten.

Akrich et al. (2002)

Observation and ideation both take a lot of time and designer resource. So why do them? They are done to minimize the impact of unintended consequences. As risk management strategies, they reduce the chances of outright failure. In making decisions, the goal is to create design processes that are resilient but not rigid, and that can adjust quickly to changing market circumstances and unexpected behaviors.

This key justification for knowing as much as possible about your audience or exploring as much of the design space as the budget allows is not to generate that genius Apple-beating design. Nothing substitutes for the skill and intuition of the development and design teams. But even the best development team is imperfect. We are human; our intuitions and even our systematic logic are fallible in the face of factors outside our knowledge or control. To make a financial analogy, the point is to make bets based on a fundamental analysis of the audience through observation and to create a hedge against the unexpected with a diversified portfolio of ideas. To do neither is to be at the mercy of unintended consequences.