

The use qualities of digital designs

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Interaction design is about creating conditions for good use of digital designs. But the only way to learn those conditions, to understand the relations between design choices and resulting use, is still largely by practice and apprenticeship. I propose to think about interaction design in terms of use qualities, i.e., certain properties of a digital design that are experienced in its use. Such qualities transcend the specific design and offer a language in which to talk about desirable design outcomes. I present a map of some twenty proposed use qualities and discuss them in some detail.

INTRODUCTION

The nature of computing has changed over the last twenty or thirty years. More importantly, the use of computing has evolved accordingly. This is obvious but still deserves pointing out now and again. Whereas computers largely used to be tools for well-defined business tasks, they are now used by most people for general knowledge work, social communication, entertainment, recreation, shopping, creative expression and so on. A crucial difference between then and now is that most use is discretionary. People choose to use a digital service or product if they want to; otherwise not.

Interaction designers are concerned with creating conditions for good use. We do not know, however, what those conditions really are. One thing that should be clear from the above is that good use is not confined to efficient and error-free performance of tasks with set goals.

In my own design work, I have been occupied at times with reasonably large sets of (somewhat) structured information. How could we imagine people drawing more value, benefit, meaning from such information spaces? And what can I contribute as an interaction designer? A few examples are *Sens-A-Patch* and the *post-hoc worknotes* project (Löwgren, 2001; Andersson et al., 2002; web-09).

As I developed concepts and prototypes, studied the empirical research around knowledge work, and explored the ideas of other designers working in the field, a certain use quality started to emerge as highly relevant to good use. Following the Pliant research group (web-08), I call it the quality of pliability. A set of information is pliable if it feels to the user like a responsive material. Inquiry, exploration and learning is a tight loop between senses, thought and action. I make a move – the information, the material shapes and responds – I notice something – I make another move – and so on.

Pliability is an example of a use quality that I propose as important for a certain class or genre of digital designs. At times, I have even claimed that there exist genre-essential use qualities, i.e, qualities that are necessarily present in the use of all instances of digital designs belonging to the genre in question. Currently, I am prepared to back down a bit. After all, it is perfectly possible that there are examples of good use in, e.g., interactive information spaces that are not pliable at all.

I do, however, stand by the idea of identifying important use qualities. It is my firm belief that attempts to articulate genres in digital design and their corresponding use qualities are quite valuable in bringing the field forward. First, they help practicing designers identify and move in relevant directions in the early phases of contact with a new design situation. Secondly, they help clarify the communication between designers and other stakeholders, primarily the clients. Thirdly, they provide a format for constructing transferable design knowledge and thus hint at one possible expression for a science of digital design.

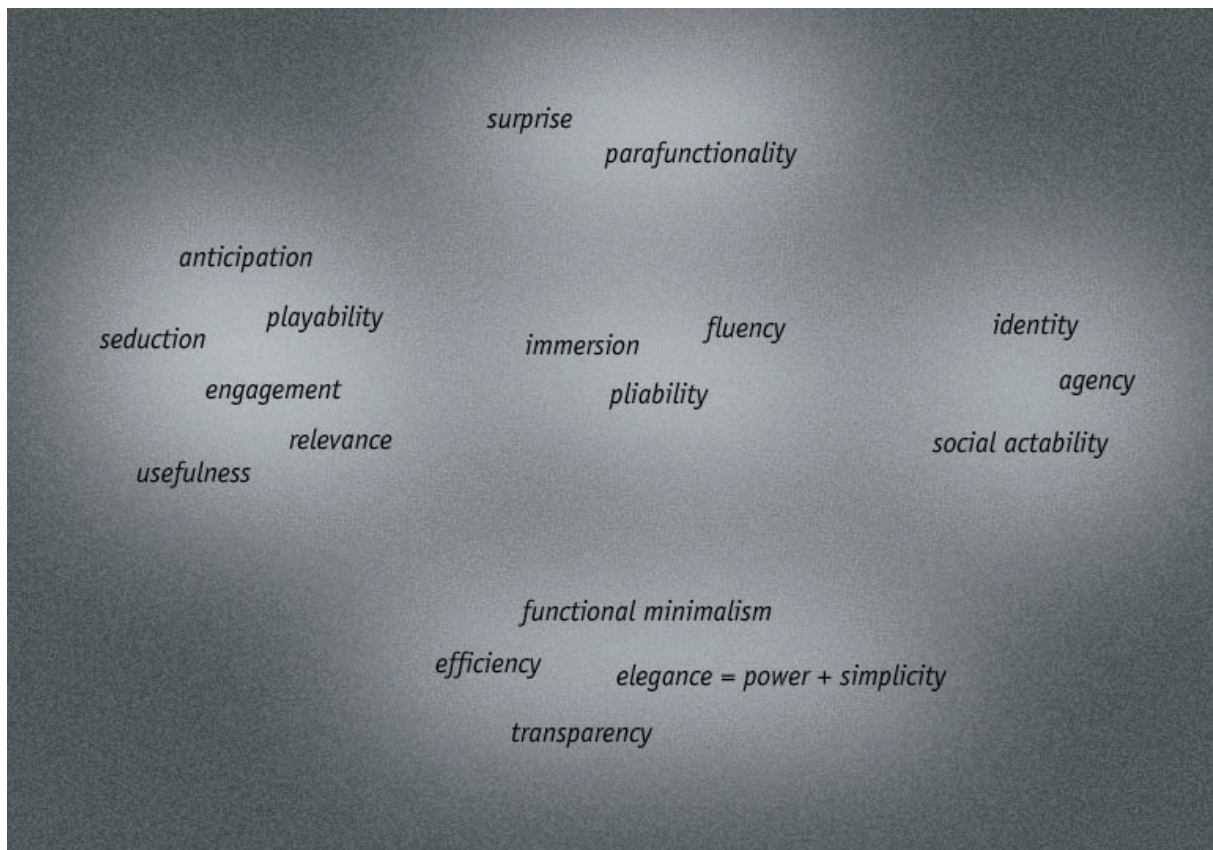
IDENTIFYING USE QUALITIES OF DIGITAL DESIGNS

In the following, I identify a few use qualities of digital designs that I find important and possibly fruitful. They are grouped together in five clusters, as the figure on next page shows.

Maps such as the one below always have a sense of finality, as though they were the last word on the subject. However, I want to strongly emphasize the tentative nature of the work. It should be seen as a statement in an ongoing debate, where the goal is not to win the argument. The goal is rather the debate itself; to modify my initial proposal, question my choices and structures, and add new concepts is to contribute to the development of an amorphous body of knowledge that facilitates design and supports better use of digital designs.

I called the map a »statement«, not an »opening statement«. There is already a debate among designers, researchers, analysts and critics on the conditions for good use of digital designs. Unfortunately, it is quite scattered across the academic literature, the trade press and the professional fora of digital design.

My work has consisted in pulling some of the threads together and relating them to each other. This is in itself a statement on what I have



A MAP OF USE QUALITIES, WHICH I PROPOSE AS BEING IMPORTANT.

chosen to include and omit, and what structure I have chosen. A small part of the map is based on my own first-hand design experience, primarily the notions of seductivity, pliability and social actability. I also have a fairly strong background in the mainstream of HCI which entails qualities such as efficiency and transparency. The rest of the concepts draw on publicly available material such as other designers' reflections, scientific use studies and digital design critiques. I have introduced some of the labels, whereas others are from the original sources.

I will now go through the clusters one at a time, discussing each proposed use quality in some detail. I then close with a more general discussion of my approach and its implications.

The group on the left consists of qualities having to do with motivation.

PLAYABILITY A game has high playability when the player says »Just one more time!« after game-over (Minter, 1997). The notion of playability is quite elusive and obviously very attractive, given that computer games is one of the few areas in digital design where the market »works« in the sense that consumer preferences have economic effects. What I mean is that computer games are assessed among players and reviewed in trade magazines. Their playability (in the sense used here) is a strong factor in the overall judgments formed by players and critics.

The literature on game play seems to suggest that playability is connected to the balance of goals, resources and obstacles in the game (see, e.g., Pearce, 1997). If the player can acquire the resources needed

to overcome the obstacles and reach the goals, but only after significant struggles, then the challenge is right to foster playability. This also entails that a highly playable game should not avoid risks. In games based on character identification, the playability would presumably be less if there was no risk of failing. The struggle needed to reach the goals can certainly involve dying and starting over a few times.

My use of the term goals should not be taken in any ultimate sense. Quite to the contrary; a highly playable game has a progression of goals where a new one is introduced as the present one is reached. In adventure games, this progression is often connected with an unveiling or a new turn in the plot. Point-scoring games typically have the ever-progressing goal of beating the previous high score.

SEDUCTIVITY A related quality is the seductivity of the use. In the words of Khaslavsky and Shedroff (1999), seduction is a process of enticement (grabbing attention and making an emotional promise), relationship (making progress with small fulfillments and more promises, possibly ongoing for a long time) and fulfillment (fulfilling the final promises and ending the experience in a memorable and positive way).

The example offered by Khaslavsky and Shedroff of a seductive digital design is the *Visual Thesaurus* by Plumb Design (web-10), a web application that adds new dimensions on the well-known contents of a traditional thesaurus by virtue of its interactive properties.

- It delivers surprising novelty for most users.
- It goes beyond obvious needs and expectations. The traditional organization of a thesaurus is mainly an effect of the (paper) medium.
- It creates an emotional response due to its visual and interactional beauty.
- It connects to personal goals: the fascination of words and concepts (and thus: mind and thought).
- It promises to fulfill those goals.
- It leads the casual viewer to discover deeper meanings of looking up a word: the multidimensional and dynamic relationships between concepts.



THE VISUAL THESAURUS.

ANTICIPATION Anticipation is a quality of use that has so far mainly been connected with dramatic structures and various forms of plot-driven interaction. Fujihata (2001) describes the interaction process as one of participation and imagination: »In an art of interactivity, one must be stimulated by interaction and enjoy having one's imagination activated. Interactivity is a stimulation of the power of imagination. By the power of imagination, one tries to see what will happen a few milliseconds ahead. This brings a future to the present. It is a bridge between a past and a future. Only interactivity can make such a jump, enabling us to escape from the chronological cage. I believe it is a real creation.«

RELEVANCE, USEFULNESS The heritage of work-oriented digital design has brought with it motivational use qualities such as relevance and usefulness. When we call something relevant, and even more so when we call something useful, we

always need to orient to a purpose: useful for what? The traditional answer is concerned with work tasks. If a system offers the information and tools you need to perform a task, then it is a useful and relevant system. The connections to modernist notions such as fitness for purpose should be obvious.

Even though the concepts are typically used in reference to work tasks, it may be noted that the words in themselves do not preclude other applications. For instance, it seems quite sensible to talk about the relevance and usefulness of a web site dedicated to (hobby) fishing. But there are certainly some limits to these and other purpose-related qualities. As we move towards entertainment and aesthetic experiences, they seem to lose their significance. Is *Tetris* a relevant game? How useful is *Osmose*?

The group of qualities in the middle have to do with the interaction, perhaps with the surfaces offered by the digital artifacts for handling and perception.

FLUENCY Digital media are increasingly infusing our environment, typically perceptible although not always in the focus of our attention. The growing peripheral presence of digital designs highlights the need for fluency. Use is not necessarily on-or-off, full concentration or not at all. It is rather a fluent dance among multiple representations. Information streams move between center and periphery as we move through the shifting environments of everyday life and work. Transitions need to be graceful and nondisruptive.

As an example, consider *Hazed Windows* (web-05), a design concept that was presented by a group of interaction design students at the Malmö University school of Arts and Communication in 2001. The topic of the project was Presence and the group had concentrated on lightweight, peripheral social communication. The affective state they sought is somehow related to the thoughts of a child who draws a picture for grandmother without necessarily going through with the bigger commitment of actually talking her parents into mailing the drawing. The design is inspired by drawing in the mist on a window: you make marks on a digital surface that is connected to other surfaces somewhere (at the grandmother's house, for instance). Your marks show up on the other surface as well. The point is that the marks fade away gradually over time, disappearing completely after a few hours. This technically simple feature makes the whole communication situation different, starts from a fresh set of assumptions regarding digital media, creates conditions for fluent use.

AUTONOMY The autonomy of a digital design has a strong influence on how it is handled and perceived. A strongly autonomous design, an agent, is an artifact that acts on its own in the world defined by the symbols accessible to it. It maintains its own goals, chooses its own means and can be said on some sense to have a will of its own. To the user, an agent is an actor who can be more or less collaborative.

It used to be interesting to anthropomorphize agents, that is, to design them with human traits or qualities. The *Knowledge Navigator* future

scenario from Apple in 1987 features Phil, the intelligent desktop agent, who looks like a clever young man with a white shirt and bowtie. The user (a university professor) instructs him in spoken language to perform tasks such as answering the phone and finding all relevant unread articles for preparing a talk. A more recent example is the »help« function in *Microsoft Office*.

On the other end of the spectrum, purely non-autonomous designs are tool-like in their character. The user wields the tool to process materials and refine them to work products. The tool is an extension of the hand or the eye; an instrument that facilitates or enables certain actions, strictly under user control.

The interesting parts of the spectrum are, of course, between the two extremes. Virtual spaces are increasingly being used as habitats for a-life (artificial life) creatures where the user/visitor can affect the course of events to some extent. In some worlds, the user constructs her own creature and then returns to learn how it has developed. An example is *The bush soul* by Rebecca Allen (web-03); artists such as Christa Sommerer and Jane Prophet have also presented work of this kind.

The genres of God-games and Sim-games can also be considered in terms of autonomy. An overall epic or a world simulation run autonomously on a long-term timescale, whereas the player modifies local conditions and hopefully the general development of the gameworld by her actions. Are such virtual spaces and games autonomous or not? Clearly, they occupy places somewhere between the pure agent and the pure tool.



RIDING THE NET.

Autonomy and fluency interact in an interesting way in the installation *Riding the Net* (Sommerer et al., 2001). The idea is that an ongoing face-to-face conversation is captured and analyzed by a system. The system recognizes a word in the conversation, sends a request for a Web image search based on the word, and then presents the returned images floating across a large display placed peripherally to the conversation participants. If the participants do nothing, the images simply float by and disappear. However, if a particular image catches a participant's eye, she can reach out and touch the display to hold the image still for a while.

One may easily imagine providing a more detailed view, richer information and perhaps spawning a more focused search by, e.g., a tap on the held image.

Apart from being an installation of digital art, *Riding the Net* can be seen as a concept for less intrusive collaboration support. In that perspective, the relative autonomy of the system in selecting search criteria and floating the images past the participants is significantly higher than for most collaboration support systems coming out of CSCW and HCI traditions. *Riding the Net* thus becomes more peripheral in a context of collaboration, and perhaps appropriately so.

PLIABILITY A set of information is pliable to the user if it feels like a responsive material; a matter of inquiry that can be manipulated in an almost tactile sense; a highly involved process of exploration where the loop between senses, thought and action is very tight and rapid. I make a move – the material shapes and responds – I notice something new – I make another move – and so on. Ahlberg et al. (1992) discuss a similar quality in their concept of dynamic queries, and call it tight coupling.



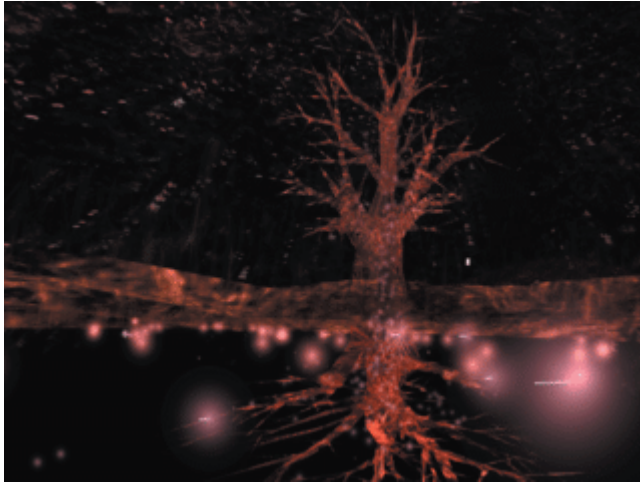
SLIDING ACROSS
A SENS-A-PATCH SURFACE.

On a superficial level, I attempted to explore the notion of pliability in the design of the *Sens-A-Patch* interaction technique for navigation of moderately sized information spaces (Löwgren, 2001). It is based on the idea of spatial constancy – information elements stay in the same place on the navigation surface through a session and across sessions. In order to fit many elements onto a small surface, the presentation is based on overlapping clusters, on of which is active at a time and the rest are visually faded into the background (but still legible). The user experience indeed seems to create a certain

amount of involvement, at least visual interest. In one case when *Sens-A-Patch* was used to present all the contents of a web site, some users reported staying on the first page longer than their information demands required, in order to play with the sensation of navigating the surface.

As we move beyond the surface, pliability as opposed to rigidity is a possible direction in many fields of administrative data processing (Henderson & Harris, 2000; web-08). It is often the case that the use is unnecessarily constrained and structured merely because of the underlying database structures used for implementation. It is quite feasible to work in the direction of more free-form data, basing disambiguation and other technical needs instead on social mechanisms. A simple example is the rediscovery of the margins of paper forms, where annotations can be made and tied to the appropriate context (the form itself) for future interpretation. Most existing databases could easily be augmented with free-form fields similar to the margin.

IMMERSION At the focus of our attention, handling and perception can become immersive. Digital design offers possibilities for quasi-physical immersion by means of virtual reality technologies. The idea is to fill our sensory organs as much as possible with the »virtual world« and the canonical example is, of course, *Osmose* by Char Davies (web-07). In addition to visual and auditory immersion, the most powerful immersive effect in *Osmose* comes from exploiting our kinaesthetic sense of body and motion. Moving around in the *Osmose* world is accomplished not by making artificial gestures with datagloves, but rather by breathing in and out



THE OAK TREE BY THE POND IN
THE OSMOSE WORLD.

and by shifting your body weight. Technically speaking, there is a sensor around the chest that is connected to your height above ground in the virtual world. You are standing on sensors that are connected to speed and direction of travel. The experience of navigating through the profoundly bodily function of breathing, however, is not reducible to simple technical understandings.

As we all know, immersion does not require expensive equipment for sensory surround-stimulation. There is another kind of immersion that comes from engaging so deeply in the task at hand that the world around it ceases

to exist. In terms of digital use experiences, it occurs sometimes when writing, drawing, surfing the web. A slightly more passive but very real form of immersion comes from participating in or being told a captivating story. But the perhaps most immersive activity in the digital realm is programming, where complex structures are built in the delicate balance between the programming language constructs and the limits of the programmer's mental capacity. The following quote by Alex McLean (web-04) should be familiar to many programmers although the specific visualizations may differ widely.

Consider this mailing list post, part of a discussion about the »feel« of computer languages.

»I've always pictured programming as a dance of sorts, very slow and each gesture receives a great deal of attention, so that a limb or a step would not stray from a particular path. Loops look like pirouettes to me, I/O feels like delicate gestures with one's hands, no, just the fingertips drawing patterns in the air. Conditionals and cases are tumblers and jumps (into the air, that is). Arithmetic is kind of hazy, controlled slides with no traction (think »slick moves«), things being pushed and brushed aside.«

A program in execution is a program in motion. Control flows around the program, taking data with it. Data flows into the program, and is breathed out again. A hacker staring intently into her screen is probably turning somersaults in her mind.

The group of qualities to the right have to do with actions and their outcomes, on social levels rather than the handling and perception of surfaces themselves.

IDENTITY Constructing and maintaining identity is central in the use of digital designs, which possess symbolic use qualities like any other designed objects. The culture recently growing up around skins for accessory desktop applications demonstrates our common desire to project just the right image. Translucent covers in vaguely organic shapes have been fitted onto all available computing peripherals since the groundbreaking introduction of the *iMac* in 1998.

But the construction of identity runs deeper than merely picking the right skin (whether made of pixels or of plastic). The software of Kai Krause and colleagues at MetaCreations in the 90s, the best known examples perhaps being *Kai's Power Tools* and *Bryce*, were mostly discussed in terms of their innovative interfaces. However, the technical functions offered by the software were far more important (albeit perhaps less noticeable). Fairly sophisticated image manipulation, 3d modelling and high-quality rendering were made accessible to a general audience and their desktop computers for the first time. The software focused on visual results, hiding much of the complexity behind a layer of skillfully designed abstraction. Users with no training or innate talent in the visual arts could produce stunning results quickly and with little effort – a significant contribution to the ongoing project of reconstructing your image of yourself.

ACTABILITY The extent to which a digital design empowers you to act is called (social) actability. We may think of it as a space of possible courses of action, shaped by many factors including the digital tools and media involved. Classic examples include the ATM and the redefinition of the bank in everyday life, and the possible uses of anonymous conference boards for open-hearted discussions as well as for vicious personal attacks.

When we look at fiction and narrative settings, the corresponding use quality is typically called agency: the power to take actions with effects in the dramatic universe (Murray, 1997).

A slightly more elaborate example is *Avatopia* (Gislén & Löwgren, 2002; web-02), an ongoing attempt to create a forum for nonviolent societal action among young teenagers in Sweden. Our design work has been driven mainly by the goal of creating good-enough conditions for societal action. In other words, it is an example of design for actability. Most of the major design decisions can be traced to this goal. For instance, the forum consists of an avatar world in interplay with a short daily magazine on public-service TV: broad visibility is necessary for societal action. There is a rather innovative tool in the avatar world for collaborative creation of film: expressive tools for action, fitted to the medium of dissemination. A group of teenagers have participated in the design of *Avatopia* and will now move on to becoming beta-citizens as the avatar world is implemented: the world is inhabited by reasonably experienced citizens already at public launch, hence the norms for action in *Avatopia* will be more or less in place (socially speaking).



FROM THE AVATOPIA DEMO
(WORK IN PROGRESS).

FLEXIBILITY There is a tendency, not the least among designers, to think of digital designs as something that is finalized in a development process and then deployed among the user community in its final shape. This is many times adequate and not at all strange, given the heritage of mass production and specialization of the industrial age. But at the same time, it is a case of under-using the potentials of the digital material. The use quality of flexibility is becoming increasingly relevant and deserves some consideration.

The canonical example here is, of course, the spreadsheet. *Microsoft Excel* and similar applications might seem like straightforward business tools for financial calculation, but in fact they are highly sophisticated programming environments. The programming paradigm is quite different from what is normally thought of as programming languages, and it is apparently easy to learn and use for people without training in programming. Millions of people are doing systems development every day when they construct spreadsheets with calculation formulae, for personal use or for the use of colleagues in the group or department. Most of these system developers have no formal training in systems development; many of the systems they develop continue to grow and evolve locally as the business needs change.

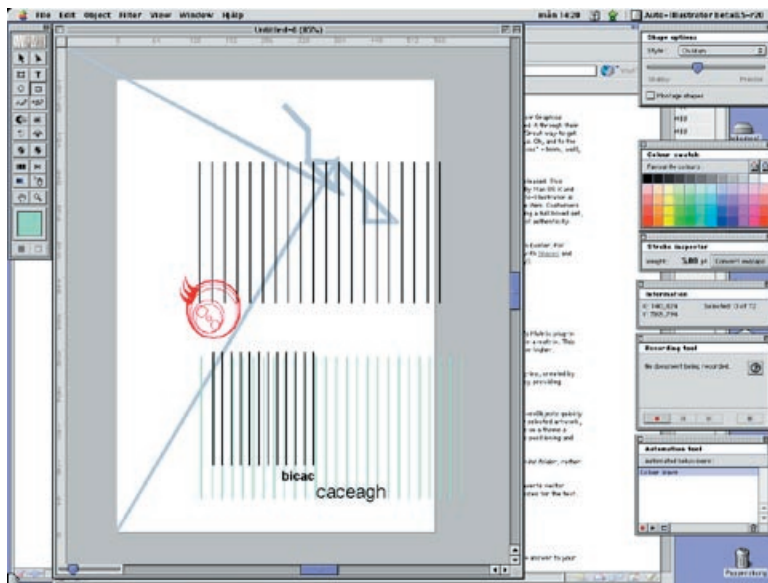
An increasing demand for flexibility can also be seen in the hacker communities and their public outlets in the form of open source projects, where design and use are closely linked in a never ending development process. The basic rules are that you are free to use any program you can find. If you don't like it, you don't file complaints. Instead, you modify it according to your needs and give your modifications back to the community. This culture of freely sharing work and building upon the work of others can be found not only among programmers but also in, e.g., music, web design and the digital arts. The idea of extending it to mainstream application domains other than spreadsheet calculation is clearly appealing.

The group of qualities at the bottom of the map are mediations of structural qualities, engineering ideals as reflected in use qualities.

EFFICIENCY, TRANSPARENCY The efficiency of using a digital design is typically connected to performing tasks with external purposes. Efficient use is rapid and error-free. The interface stands between the users and their tasks; ideally, the interface is transparent, such that the required operations can be carried out without distractions. The field known as human-computer interaction or HCI is mainly oriented towards improving the efficiency of computer-supported tasks.

ELEGANCE The (technical) elegance of a digital design is a combination of power and simplicity (Gelerntner, 1998). As a general aesthetic principle for engineering, an artifact should perform as well as possible with as simple a construction as possible. For programming, this translates to creating elements (modules, objects, subroutines, programs) that compute rapidly in few lines of source code. Note that simplicity is not a simple concept – a highly efficient and compact program can be almost impossible to understand for all but a few experts, still be considered an elegant piece of work.

FUNCTIONAL MINIMALISM . . . The elegance = power + simplicity formula is often translated to the realm of use qualities, more or less consciously. The idea of functional minimalism can be seen as a reaction to the exploding number of features in many mainstream applications: provide tools that do their core



AUTO-ILLUSTRATOR IN USE.

functions well and nothing else. The example presented by Shedroff (2001) is the *Black Berry*, a wireless PDA strictly limited to the functions of paging, email, notepad, and personal organizer.

When the concept of *Magic Lenses* was introduced by Xerox Parc in 1993 (web-06), the combination of power and simplicity made the idea resonate with many people. A *Magic Lens* is basically a semi-transparent desktop tool that you can move over objects in a visual interface to get »behind the surface« of those objects. The

first demos showed lenses that presented properties of graphics objects and made them available for editing; the concept has since been applied to various information visualization tasks. The power of the *Magic Lens* is in the generality of the concept and the ability to see all the way into the heart of the interface objects; the simplicity is in the immediately recognizable operation.

Finally, the group of qualities at the top of the map have to do with creating a distance between the user and the digital design. Distancing as a design strategy is mainly found in critical art, although there is the occasional attempt to use distancing qualities analytically in understanding also work-oriented use. One example is Holmlid's (2002) discussion of surprise and confusion as a complementary pair of aspects found in professional IT use.

SURPRISE When you use a digital design, it is surprising if it challenges your assumptions. *autoIllustrator* by Adrian Ward (web-01) presents itself as a prototypical member of the productivity tool class, a vector drawing program that looks a lot like *Adobe Illustrator* and even has a similar name.

Once you start using it for drawing, however, you are constantly surprised. The tools in the palette are not quite like the draftsman's tools you expect, but more playful and (perhaps) somewhat threatening. For example, there is a setting that distorts your shapes such that, e.g., if you try to draw a square it comes out as a children's drawing of a house. The color palette reacts to your choice of color by calling you a sissy and suggesting a really strong color instead. There are little creatures called bugs that walk around your drawing surface on their own, leaving ink in their trails. Your assumptions are challenged with respect to the autonomy, the toolness of the program.

PARAFUNCTIONALITY Dunne (1999, p.44) defines parafunctionality as a form of design where function is used to encourage reflection on our relation to technology, or »how electronic products condition our behavior.« Using a parafunctional object creates a heightened sense of distance, mainly because it is

conceptually difficult to assimilate into your view of reality. To acknowledge its usability is hence also to discover new ways of seeing (parts of) the world. It should be noted that some parafunctional designs cannot be (safely) used, such as the *Intolerable Object* by Philippe Ramette whose lens focuses sunlight onto the top of your head. Modelling a use scenario in your mind is in many cases enough to achieve the enstrangement motivating the parafunctional design.

An example of parafunctionality in digital design, striking in its simplicity, is the ATM competition proposal by Jeff Kipnis (cited in Dunne, *ibid.*): »People like to play lotto and people like to use the ATM. Why don't you make it an option in the ATM to say put your card in and say, I'll bet a little bit and see if I can get a little more out, so you ask for twenty dollars, and you push the button, and you could get twenty-five or you could get fifteen.« I would expect that most readers have never thought before about combining lottery and the ATM, but once the idea is introduced it gives rise to all kinds of thoughts from ATM use to the role of money in society and everyday life.

DISCUSSION

In the introduction, I claimed that the attempt to articulate use qualities of digital designs serves three purposes in bringing the field forward.

First, a vocabulary of such qualities can be helpful to practicing designers in early phases of a development process. In the initial contacts with a design situation, not very much is fixed and any road forward might be equally fruitful (or fruitless). If one or a few desirable use qualities can be identified, roughly on the level of abstraction illustrated here, the design process will more easily develop a sense of direction. As work proceeds through conceptual to more detailed phases, the desirable qualities can be gradually refined into more specific goals.

From a HCI point of view, the approach I hint at above is a possible answer to the commonly observed shortcoming of usability engineering: that it is impossible in most cases to specify measurable usability goals as early in the development process as the typical methodologies would have it. Similar ideas of starting with more abstract goals, then gradually refining them into a usability specification, have been advanced. An example is the notion of user experience goals suggested in the recent textbook by Preece et al. (2002).

The second purpose is in clarifying communication between designers and other stakeholders, primarily the clients. Different techniques have been developed in the design disciplines to deal with this notoriously difficult area, including the graphic-design practice of collecting and discussing examples sharing a »tone« that we want to reach also in the project at hand. Similarly, desirable use qualities can be communicated and clarified by means of examples early in a digital design process.

Finally, the role of research in digital design as in any other field is to construct and disseminate knowledge. If we assume that the development of digital systems is a design discipline, it follows that the forms of knowl-

edge produced by research must be aligned with the forms of knowledge used in design. It is my belief that the articulation of use qualities in digital designs can be a valid research contribution, provided that the results observe the usual criteria for scientific knowledge production.

One specific criterion deserves a short note: the use qualities thus articulated have to be transferable. This means that they are meaningful outside the context in which they emanated and that enough data and sources are provided for the reader to critically assess the value of the constructs provided. As I hinted above, I believe that the articulation of use qualities such as the ones above are one half of the constitutive relationship in which a genre is constructed and maintained. Genres thus define the scopes of essential meaning for the articulated qualities. An over-simplified example of this argument would be the observation that playability has no meaning, or at least no place as a desirable quality, in the design of an industrial process supervision system. (Although it might have in the context of training the process operators, as opposed to the supervision and maintenance of the actual process.)

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