Sketching User Experiences

getting the design right and the right design

Bill Buxton

MK®
MORGAN KAUFMANN

TTX THUMBNAIL

REDUCE DRAG - 10%
INCREASE STIFFNESS
MAKE TOUGHER
LOOKING

AIR FLOW

AIR FLOW

SANT

DOWNTUBE STIFFNESS
+ 15%
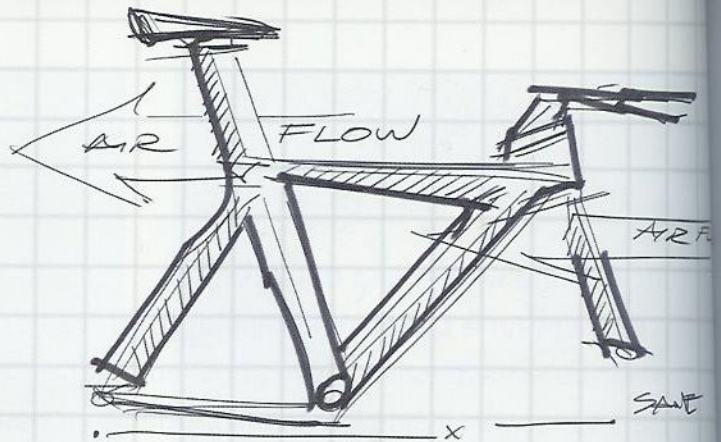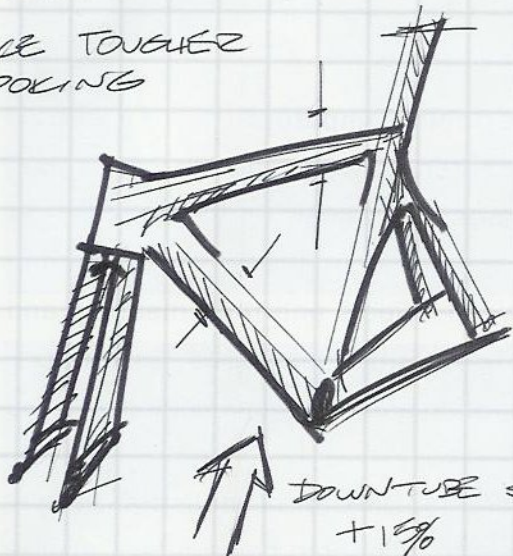
CHANNEL AIR FLOW
AT TOP TUBE
- ATTACH AT
SEAT STAY

Figure 95: Words Meet Images
Here a combination of drawings and words give information that neither
could do on their own. Besides understanding just the form, we gain
insights about the rationale for the design, including issues such as
aerodynamics and strength.
Figure: Michael Sagan.

Visual Storytelling

Every Picture Tells a Story.
— Rod Stewart & Ron Wood

From words we now move on to images, and visual story-telling. Of course, in so doing, we don't abandon the word altogether. We just add another tool in our sketching arsenal. In fact, the bicycle concept shown in Figure 95 is one example of how words can be incorporated into a sketch.

The foundation for this section was laid back when we were discussing the sketches of the Trek time trial bike. These provided a means of introducing the role of traditional sketching in design. I bring them up again here as a reminder that traditional sketching has an important place in experience design—they are just not sufficient.

So, having people on the team that can draw and produce effective traditional sketches is really valuable. But then, that leaves me out. My wife, Liz, is a professional painter and my eldest son, Adam, an illustrator. What that means is that I need no reminder of the limitations of my drawing skills. What my eye doesn't tell me, they will. Consequently, I do my best to work with people whose skills complement mine, and who have the same facility with a pencil as Liz and Adam. But despite my best efforts, reality dictates that sometimes I have to fend for myself. So what is one to do?

The first thing that I would say is, "Get on with it." I take marks off my student's work if their sketches are too good—among other things, it indicates that they spent too long on them. So don't worry if your drawings don't look like Rembrandt's, and remember the *power law of practice*. It confirms that although practice will not necessarily make you perfect, it will certainly help you improve.

To help you with this, there are lots of books and courses. Nanks & Belliston (1990) is just one. If you are quite accomplished already, then look at books like Powell (1985). No matter what, practice!

In terms of improving my own limited skills, one of the things that gave me great encouragement took place in New York City in 1997. My wife and I were going through a retrospective exhibition of one of my heroes, Robert Rauschenberg, at the Guggenheim Museum. About three-quarters of the way through the exhibit, I had an epiphany: There was nothing at all in the exhibition that suggested that Rauschenberg could draw!

What the exhibition told me was that one of the most influential visual artists of the second half of the twentieth century achieved that stature with only limited drawing skills. As an aside, a follow-on speculation was that those same limitations may well have been a key catalyst to his creativity.

The take-away lesson from this story—even if the art historians in the crowd discount it totally—is that Rauschenberg points to a way for people like me to augment their meager talent: just find another way that you can manage, and get your ideas down. To help get you started, let me give you a few hints that work well for me.

The first is to do what we used to do in kindergarten—trace. What I do is take digital photos, or
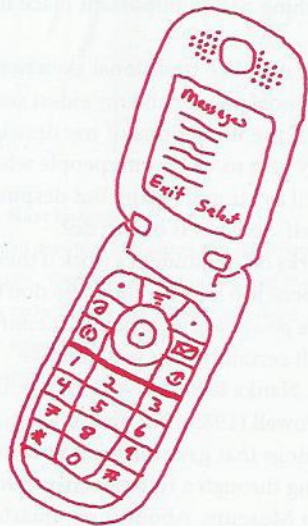
Figure 96: Sketch as "Manual Photocopy"

Since my talent at drawing is about the same as yodeling (don't ask), the fastest way for me to get a sketch of a phone is to trace a photo of the real thing. I load it into a sketching program as the background layer (top left), add a second layer on top, and trace the outline in red (top right). I then make the background layer invisible, and end up with what looks like a reasonably well-proportioned and recognizable sketch of a mobile phone.

Figure 97: Phone Graffiti

Here I have used the same phone as the background. This time I have added a hand-drawn screen on the display.

scans of images, and load them into a drawing program. As Figure 96 illustrates, I add a transparent layer on top of the image, such as the mobile phone in the top-left image, and trace over it. (In film-making, the fancy name for this is rotoscoping, so if you feel too old for tracing, then you can use the fancy term.) Regardless of what you call it, once you have finished tracing the object or person (top right panel in figure), you can hide the background photo. This leaves you with only the hand-drawn version, which you can save and then use in other drawings—sort of like your own sketch clip-art. You have something that you can do quickly to function as a sketch, and which has proper proportion, perspective, and such. So it is a start. I did the example in Figure 96, including capturing the screen snaps, in less than five minutes.

The second technique is a slight variation on the former. In this case, you just draw on top of the photographed object. As is shown in Figure 97, I have added a (clearly) hand-drawn interface onto the screen of the photographed phone. The resulting composite has a sketch-like feel, despite the bulk of the image being a photograph.

The potential impact and use of this kind of technique is shown to really good advantage in the two images in Figure 98. In both cases parts of the original photos were traced over and transformed into cardboard-type sketched characters. By tracing, the position, pose, and proportion are correct. Achieving this effect is technically simple in terms of technique and technology. The key ingredient is imagination.

The result is really effective. The photographs were clearly taken by someone with professional level skills, and would never be considered to be "sketch-like" on their own. That is precisely why the traced figures stand out so much and work so well—they are just so incongruous in that visual context. They catch your eye, and despite the detail being in the photo, your eye is drawn to the sketch. As Andrea del Sarto says in Browning's poem, "Less is more."

In these examples, be clear that I am not trying to give a comprehensive or even short course on image making. I am just trying to make a few points:

Conventional sketching has an important place in interaction design.
Even those without a great deal of natural talent can improve their drawing skills with practice.
There are a range of techniques and technologies that can be used to create images that serve sketch-like purposes (we have only touched the surface).
Remember the Rauschenberg Effect: The limiting factor is your imagination, not technology or technique. There is always a way to express an idea appropriately within your means.

That being said, if traditional sketching were sufficient to handle the types of things that we want to design, there would be little need for this book. As I have said previously, the main drawback of conventional sketching has to do with its limitations in capturing time, dynamics, phrasing—the temporal things that lie at the heart of experience.

Figure 98: Hybrid Photo-Graphic Composition
A bit of tracing and drawing can enable a well-crafted
photograph to serve as a sketch.
Photos: Aldo Hoeben ID-Studiolab, TU Delft

Sequencing Images: Scott and Ron's Agenda

Let me give you a simple exercise to illustrate what we are up against here. Ideally on paper, but at least in your mind's eye, I want you to make exactly two sketches:

- A sketch that captures a literal representation of the physical nature of your mobile phone (or iPod, or Palm Pilot, etc.)
- A sketch that captures a literal representation of the behaviour of the user interface of your mobile phone (or iPod, or Palm Pilot, etc.)

The first sketch is easy, even if you are terrible at drawing. The second is almost impossible, no matter how good you are at drawing. Pretty interesting, and therein lies the problem. If we are going to exercise anywhere near the level of control over the interface, we need to be able to sketch its essence as fluently as we can sketch the physical form factor. So we need to expand our repertoire of techniques.

The most obvious way to do so is to use more than one image to tell the story. As we already know, this is the foundation for comics as well as the storyboards used in the preproduction of films and video games. This is also a technique that has been used extensively in user interface design.

Another technique is to use something that is called a *state transition diagram*, which can be used to make a kind of map of the displays in an interface. An example of both used together is illustrated in Figure 99.

These drawings were made by Ron Bird, working in collaboration with Scott Jenson. Ron is a pioneer in using all kinds of techniques to make early sketches of interfaces, such as for photocopiers and mobile phones. Scott has a long background in designing interfaces for handheld products, ranging from personal digital assistants (PDAs) to cell phones. The images in the figure represent an early user interface concept that they were exploring for use in the agenda/day-timer of a handheld PDA.

As I said, these sketches represent time in two different ways.

The first technique used in the figure is the familiar convention of a comic strip. That is, Ron has used multiple images to portray the state of the display as one goes through a particular sequence of transactions. In this case, the scenario represented is checking your calendar for the time of a meeting, and sending a message to the person that you are meeting with:

Far-left screen, 1.a: Looking at the agenda and seeing that there is a 10:00 A.M. meeting with someone named "Mary Ford"
Middle-left screen, 2.a: Checking what that meeting is about
Middle-right screen, 2.b: Choosing how to contact Mary
Far-right screen, 4.a: Sending her a text message concerning the "Tour," which was the topic of the meeting

The second way in which time is represented is the state transition diagram technique that I mentioned earlier. Below the sketch of each screen, there is a rough drawing of a navigation "map" that shows the relationship of the various screens to each other. For each of the screens shown, its particular location in that map is highlighted. There are paths connecting some of the screens to each other. These let you know "if you can get there from here." So the screens constitute the "states" and the connecting paths the "transitions" that are possible to or from any particular state (or screen).

To help in reading this map, Ron and Scott have laid out the map in a grid and labeled each screen sketch in a way that identifies its map position: the number, such as in 2.a, indicates in which map column it sits, left to right, and the letter indicates which row, from top to bottom. Hence, we know that we have seen only four of the eight screens of the design.

These types of sketches help the designer explore and communicate the look or character of a particular design approach. They also help explore the dynamics and flow. Although the sketches are static, hanging them up on the wall lets the designer ponder issues such as what action takes you from one screen to another? For example, one might ask, "How do you move to screen 2.a, rather than 2.b. from 1.a?" The representation also helps us contemplate other time-related questions, such as, "What is missing?, Is the flow right?, Are there too many screens?, or Could there be a better way to approach this?"

Because these kinds of sketches are relatively quick and easy to execute, the designer is afforded a way to explore a number of different approaches to the design, in terms of graphical style, functionality, and the flow of the interaction. Far more variations can be explored on a given budget than would be possible if one was implementing the designs in code, for example.

The practice of mocking up screen shots either as a storyboard or in a *PowerPoint* presentation is pretty common in user interface design. So let me tell you why I chose this example. The incorporation of the state-transition diagrams was my first reason. This is something that I think is really useful, but not generally practiced. Second, the biggest and most common mistake that I see is that people start with screen graphics that are so realistic that they could easily be mistaken for the real thing. This is not the case with Ron. The relevance of his hand-drawn artwork to the ultimate product is clear in the example and does not require any great conceptual leap.

High fidelity screen renderings certainly have a place—just much later in the design process, before implementation, but almost never, if ever, at the early ideation phase.

One other comment, following my using the words "storyboard" and "*PowerPoint*" in the same sentence. They are different things, and not just because of the technology. If you presented exactly the same screen shots as a storyboard and as a slide presentation, such as with PowerPoint, the results would be very different. In technology jargon, the storyboard presentation is space multiplexed, but the slide show approach is time multiplexed. In everyday language, with the storyboard, time is distributed in space, and you can see all screens simultaneously. With the slide-show approach, they are seen sequentially, one after another. Both have their place, but they are different, and this is worth keeping in mind.
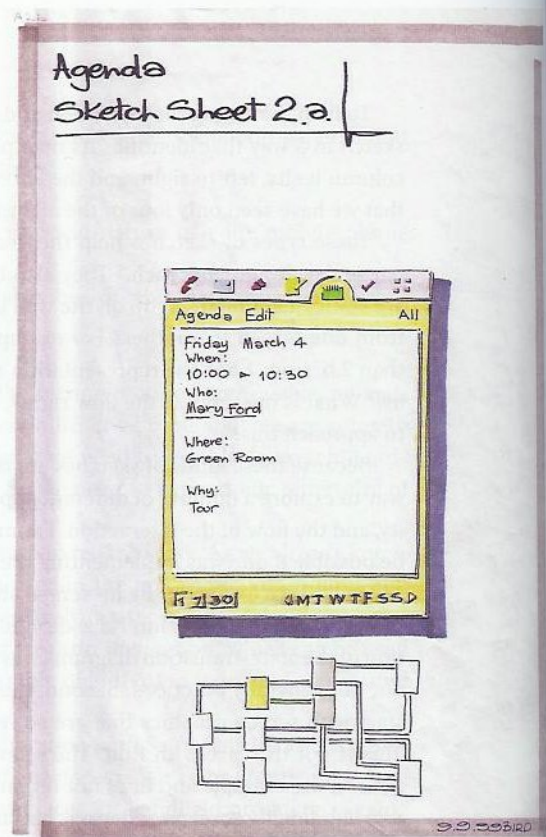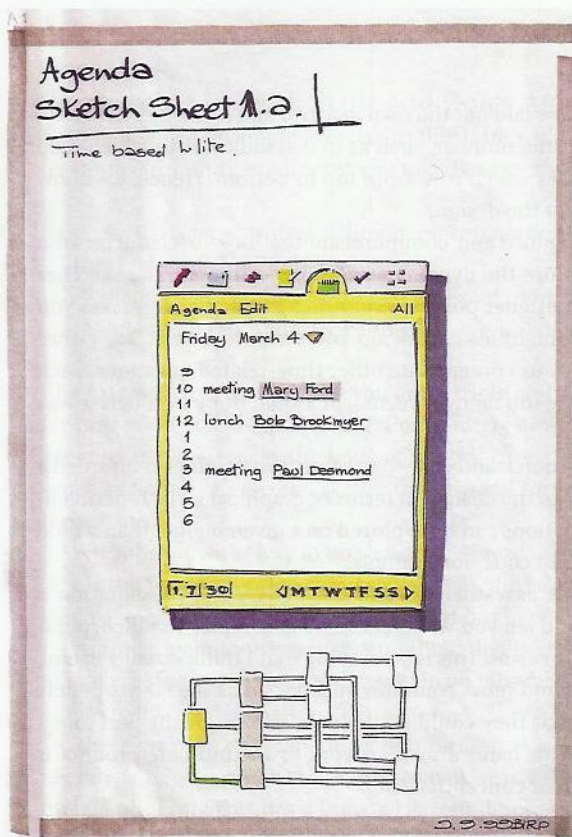
Figure 99: Sketches of PDA Agenda Screens

The sequence of images sketches out a potential design for interacting with
a PDA-based agenda. Each image is like a key frame in an animation. No-
tice the state transition diagram at the bottom of each image, which shows
its context relative to the others, as well as the overall page hierarchy.

Images: Ron Bird

Agenda
Sketch Sheet 2.b.

Agenda
Sketch Sheet 4.a.

Agenda Edit · All

Friday March 4

10 meeting Mary Ford
11
12 lunch
1
2
3 meeting
4
5
6

Mary Ford
Call
Message
Search...

1.2/30 ◁ M T W T F S S ▷

Messaging Edit · Draft

To: Mary Ford
Re: Tour

abc @

2.2.2 BIRD
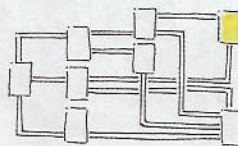
2.2.2 BIRD

Figure 100: Zone Tactics

These boards were created to explore the interaction model of a proposed pervasive electronic game. They capture more the spirit of the play than the details of the technology design.

Images: Mark Outhwaite

Saturday Afternoon

Charmaine: Heading out to meet Tobias

Tobias: Uploading new Phyzzles to his Tac Pac

Tobias: Heading out to meet Charmaine

Tobias: Closing in on Tower Hill
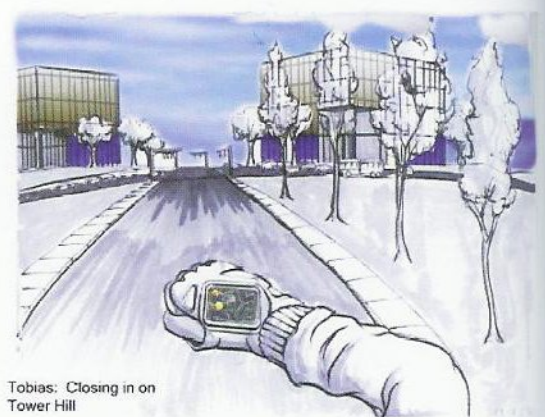
Boarding a Game to Avoid a Boring Game

There is one other thing that I want you to notice in Ron's drawings. There are no people in them.

This in itself is not a bad thing. But I would argue that before one ever gets to this stage of design, one needs to have spent a lot of time exploring the social, personal, and physical context in which the system is to be used. Almost by 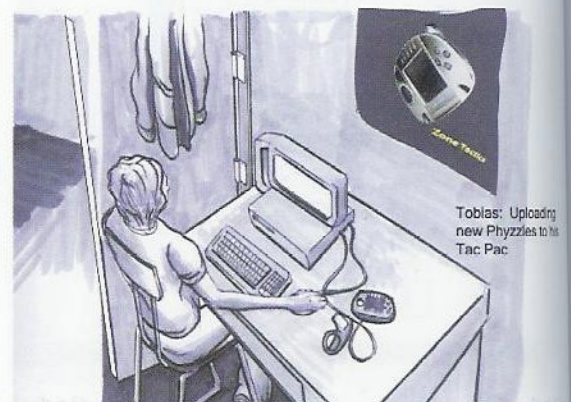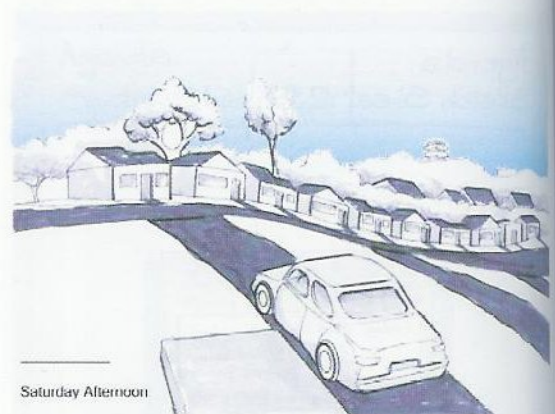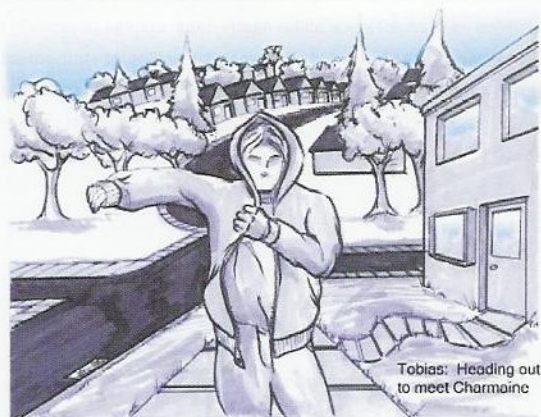definition, this requires representing not only people, but also their emotional state, and where they are physically. How can you get the details right if you haven't looked at the big picture first?

Here again is a place where storyboard techniques can be used to really good advantage as a means to explore, brainstorm, capture, and communicate ideas about use and experience.

To illustrate this, my next example, Figure 100, is from the final year project of Mark Outhwaite, a recent graduate of the Ontario College of Art and Design.

These are structurally similar to the images that Ron Bird made in Figure 99, (minus the state transition diagrams), in that they are a sequence of hand-drawn frames. However, Outhwaite's storyboard is very different in intent. Here the emphasis is clearly on the spirit of the play, and how the lifestyle and the location of the players might impact the design of the physical form factor and the software of the game.

This example also provides an opportunity to reflect on our earlier discussion of the use of theatre and acting "in the wild" to work out concepts. It is easy to imagine how these storyboards could have been preceded and helped by running around outside in different contexts and engaging in various types of collective role-playing.

What I am trying to do here is not only point out the breadth of applicability of any one technique, such as storyboarding, but also that different techniques like story telling, role-playing, and drawing can all complement each other, and in so doing, significantly enhance our ability to explore ideas.

Each technique that we discuss is just going to add to this, and provide us with a veritable arsenal of techniques to bring to the table.
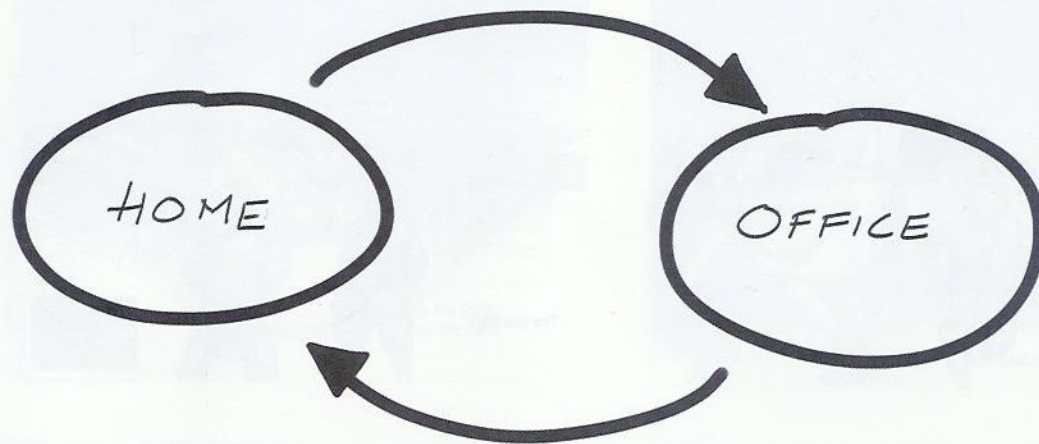
287

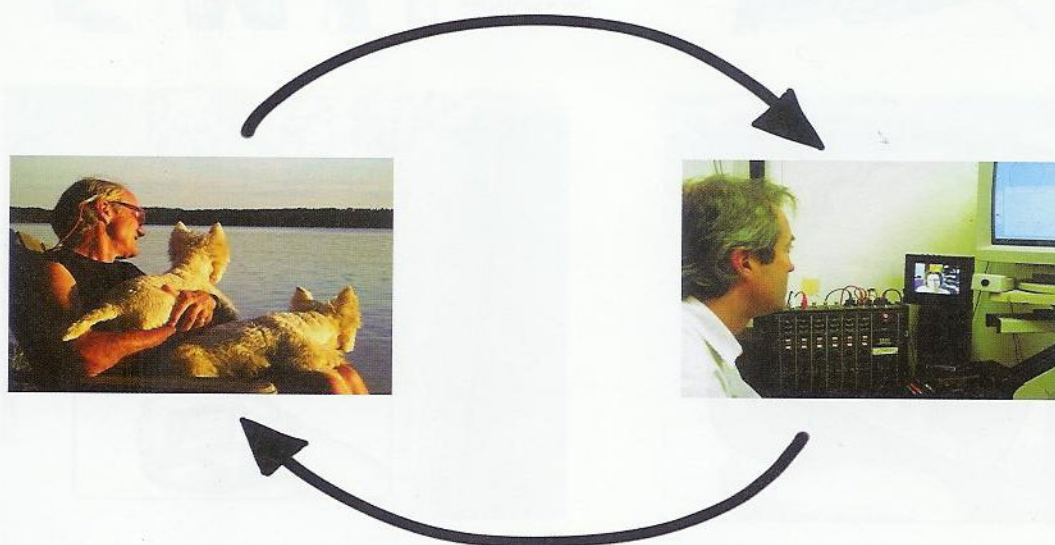Figure 101: Home-Office State Transition Diagram

Figure 102: Home-Office Photo-State Transition Diagram

Why Are Transitions Like Canada?

Because they are overshadowed by the states.

Now before you throw something at me, remember what Alex Manu said about the importance of play! And there is a point to my joke besides trying to tie in yet another thing that we have already discussed.

Look again at the storyboards of both Ron Bird and Mark Outhwaite. The focus is on the states, snapshots in time and place, rather than about the transitions. They say, "you can be here" and even "you can get here from there," but they don't tell you how you got there or what the experience was like.

Think about it this way. Let's say that you have two states—"at home" and "at the office"—and that you are always at one or the other, or in transition from one to the other. The resulting state-transition diagram would look like Figure 101.

In this representation there is little more shown about the state (other than the labels Home and Office) than there is about the transitions. Now contrast this with my second Home-Office state-transition diagram. Because of my use of photographs in Figure 102, you know way more about both where I live and where I work (the states) than you did in the previous version of the diagram. But also notice that you know just as little about how I get back and forth between home and work (the transitions).
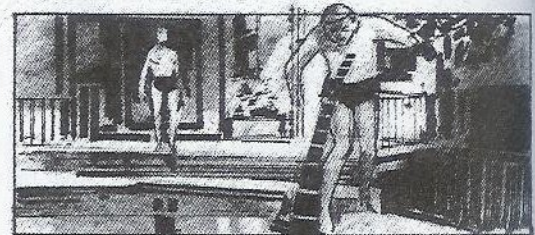
I include this example to highlight a shortcoming of the storyboards that we have seen thus far. In short, they are like Figure 102. They tell us about the state, but almost nothing about the transitions. This can be fine, but only if we are aware of the missing detail and adequately address it elsewhere, at the appropriate time and with the appropriate tools. The user's experience is shaped as much (if not more) by the transitions as it is by the states. Therefore they must be equally in the forefront during the design process. Yet, in my experience, this is seldom the case. Attention to the transitions nearly always has lagged far behind.

In talking about this, I can't help but think about something the comic book artist and writer Scott McCloud said in his book, *Reinventing Comics*. Of course, I have to quote him in image, rather than words. So look at Figure 103.
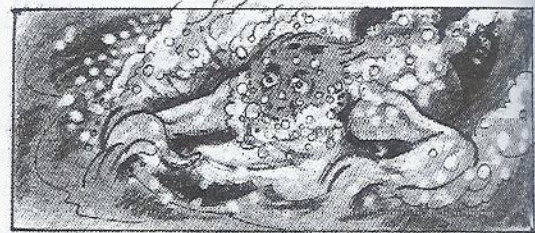
To paraphrase Scott, one could also legitimately say that the heart of the interface lies in the transitions. But interfaces are not just sequences of still images. That is, they are more than an interactive slide show. Yes individual screens change, but so do the elements in them. The user's experience largely derives from what moves, and how, when, and where this happens. As people such as Baecker and Small (1990) said in their essay, *Animation at the Interface*, this stuff is really important and we need to pay more attention to it.

So let's step back and see how we might start doing so early in the process.

To me, a good place to start is with Laurie Vertelney (1989). She was the first person that I am aware of who pointed to the film-maker's craft as a source for tools for interaction design. She was a strong advocate of the use of storyboarding, as well as many of the other video techniques that we will discuss as we go along. Her point was that cinematic techniques had been developed precisely to deal with temporal phenomena, such as timing, movement, dynamics, and the like. It made sense to use them in interaction design as well. They were simple and effective. In one way, her message was heard, and the use of video and storyboarding is now commonplace. The problem is that some of the roots were lost along the way.

The *heart* of comics lies in the space *between* the panels --

-- where the reader's *imagination* makes *still pictures* come *alive!*

78 - ZOOM BACK WITH BEN.

79 - RIGHT TO CAMERA AND FAST PAN LEFT
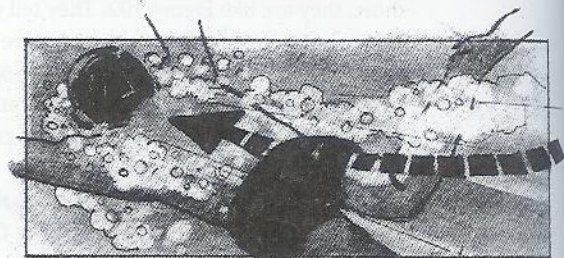
79 - AS BEN STARTS UP.

Figure 103: Life in the Gutter
Image: McCloud (2000) p.1

Figure 104: Story-Boards from The Graduate (1967)
Notice the use of graphic devices to capture the nature
of the transitions between frames.
Image: Katz (1991)

As we started to discuss in my home-office state-transition example (see Figures 101 and 102), much of what I see under the name storyboarding is just a sequence of screen shots. Yes, it tells me about sequencing and the design of the various screens. And yes, sometimes this is a legitimate thing to do. But it tells me nothing about timing, movement, or dynamics—something that is at the heart of film storyboards. And, too often, my sense is that practitioners have adopted this limited approach to storyboarding without any awareness that they are leaving out the very thing that they should be focusing on.

We can address this by going back to where Laurie pointed us in the first place: film-making.

There are lots of books on storyboarding for film. Since new titles keep appearing, let me just encourage you to explore them. But if you want my favourite from among those that I have seen, it is *Film Directing: Shot by Shot: Visualizing from Concept to Screen*. It is by the New York film-maker Steven Katz (1991). See also Hart (1999).

Let me give you an example taken from this book that highlights what we need to take into account, and how to do it. The example has three frames of the original storyboards from the classic 1967 film, *The Graduate* which are shown in Figure 104 . At first glance, they seem to be pretty closely related to the *Zone Tactics* storyboards of Mark Outhwaite that we saw in Figure 100. This is good since in many ways they are similar in purpose. But there are a few new elements in the boards from *The Graduate* that are worth noting. First, notice the directions to the cinematographer that accompany each fame. They don't just direct where to move, but *how*, at what speed, and so on. One might wonder if doing so eliminates some of the between-frame magic that Scott McCloud was talking about. I don't think so. First, this is not a comic book, but a sketch of a movie. Second, these directions still leave more than enough room for the cinematographer's imagination to play. Third, think about using this in interaction design. Incorporating alternative directions along with the boards introduces yet another technique that we can use to open up our exploration of the design space.

The other thing that is new and worth mentioning is the use of arrows to describe the motion of the character eventually played by Hoffman. This is potentially a really powerful notation. First, it shows you who or what is moving in the frame and where. But it also has the power to graphically communicate the nature of the movement itself: fast/slow, accelerating or slowing down, smooth or wobbly, and so on. All these types of properties can be captured in how the arrows are drawn, at least when drawn by someone with appropriate technique.

I want to make two final points before wrapping up our discussion of still images and storyboards.

First, even when talking about the early stages of design, I can still hear some people expressing concern about the intentionally "sketchy" nature of rendering that I am promoting. My best response, besides going back to our initial discussion of the nature of sketches, is to defer again to Scott McCloud, who again in Figure 105 says it best in pictures.

I hate the term "low-fidelity" prototype or interface. Why? Because when the techniques referred to are appropriately used, they are not low fidelity; rather, they are at exactly the *right* fidelity for their purpose. I love Scott's phrase, *amplification through simplification*. It is brilliant. It says to me that the fidelity of a sketched rendering can be *higher* than reality—at least in terms of experience (which ultimately is what we really care about). Pretty cool.

And my parents wouldn't let me read comic books! That probably stunted my education.

Finally, you might be asking, or be asked, "Why not just use video or animation to capture the dynamics? After all, are not still images, storyboards, and comic book techniques a poor substitute for this aspect of the interface?"
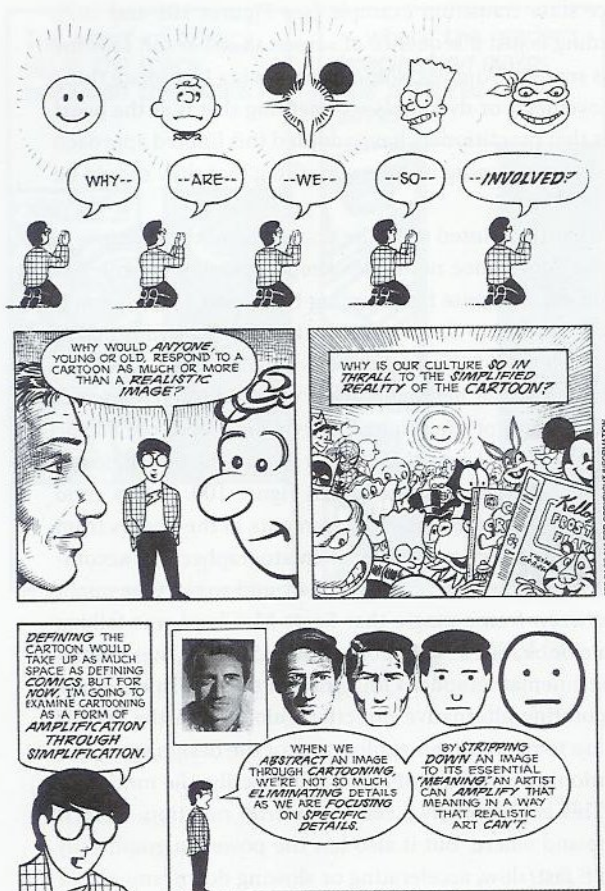
Figure 105: Learning from Comics

Comics can teach us that so-called "low fidelity" prototypes may be just the opposite; that is, they may amplify our ability to experience or understand the object of design.

Figure: McCloud (1993) p. 30

Figure 106: An Airline Safety Card

The technology design and operation are shown in context using a range of graphical techniques, all of which can be exploited in design as well.

Image: Interaction Research Corporation

There are a couple of replies to this. First, for sure animation or other cinematic and interactive forms are really powerful tools in the repertoire of the interaction designer, especially in terms of dynamics. However, ask anyone who has done both which is faster, cheaper, and enables them to explore more alternatives in a given (limited) amount of time, animation or comics / storyboard approaches? Correction. Don't ask the question. The answer is obvious.

If you are still not convinced, or need another example, look at the excerpt from the airline safety card shown in Figure 106. Yes, this information could be shown in a video. But by having it on paper, the nervous passenger can study it for as long as he or she wants. And on the way to a crash landing on water, I might prefer the card to waiting for the flight attendant to play the video again!

As an aside, see *Design for Impact*, by Ericson and Pihl (2003) for a fascinating history of airline safety card design. There is a lot to be learned about visual language by looking at the 50 years of the genre covered in this volume.

This card is certainly not a sketch. It is in the visual language of illustration and, using the vocabulary introduced on page 121, is a description drawing. But don't be lulled into thinking that the techniques that it employs do not apply to ideation. For example, through the use of arrows, the incorporation of people and context, it captures the operation of the door, as well as the intended procedure for its use in an emergency.

These are all techniques that are equally valuable and relevant in the design phase. One can easily imagine sketching a number of alternatives for discussion and evaluation. The key thing is, with a sketch using this technique, one would never lose sight of the fact that it is an evacuation process that is being designed, not just an airplane door.

To the extent that they can capture motion, the still image approaches of storyboarding and comic book art enable the whole motion to be captured in a form in which it can be placed on the wall. There it can be absorbed in a glance, and compared, side-by-side, with other alternatives. Video can't do this. But then, it can do things that storyboards can't. Good. They complement each other. Storyboards are not better than video. They are just different. Each has its place.

As I have said before and will say again, everything is best for something and worst for something else. The question is knowing for what, when, and why. Experience and fluency, based on practice, is the key to gaining the literacy that embodies such knowledge.

So let's now talk about what animation can do, and how to do it.

ntext using a range
in design as well.