Designing Interactions

Bill Moggridge

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Process

As a designer, I am much better at synthesis than analysis, so I am short on good theories about designing interactions, but I can tell you in practice how I do it. To finish my story, here is a description of the process that I have evolved for designing interactions, working with my colleagues as a community of practitioners. I have done my best to explain why interaction design exists, and how interaction designers contribute to the development process. I have stated my belief that if you are going to create good designs, you first have to understand people—what they need, want and enjoy, as well as how they think and behave. I talked about my conviction that the practice of designing interactions is enabled by prototyping, that we arrive at good designs by prototyping early and often, by trying out ideas as quickly and frequently as possible, and by taking them to the users for responses and evaluations.

A community of design practitioners from IDEO looking through stereo glasses

Photo
Joe Watson/IDEO

Is this focus on people and prototypes enough? Can we rely on just those two simple strategies to create excellent designs? I'm afraid not, as the constraints will come from the full context of the design problem, not just the people. Even so, a focus on the people is important enough to be the best place to start and is particularly valuable when we are designing something new; if we are designing a new version of something that already exists, we have to be sure that we have a full understanding of the "state of the art"—the constraints that defined the previous result.

The keywords of eople and prototypes" re needed most when nnovation is the only possibility.

Designinsigning Something New

THE KEYWORDS KEYWORDS OF "people and prototypes" are needed most when you want to want to design something that has no precedent, where innovation is tbvation is the only possibility. The essential first step will be to start from un(from understanding the latent needs and desires of the people who wple who will use the design. You are not just designing for the average personage person either; you will need to understand the viewpoints of the full rang.e full range of people who will interact with the outcome, from the slowe1 the slowest to the fastest, the most naive to the most expert, and the least e the least experienced to the most fluent. They will probably be surprisinglsurprisingly different from you, so it will only be by understanding erstanding them that you can avoid the trap of designing for yourself. :self.

The conte The context of the design problem is not just the people. You will need to ur need to understand as much as possible about everything that will affect the saffect the solution: what it is for, how it will work, how much it will cost, anill cost, and so on. Each of the team members will need to listen and learm and learn from all of the other experts to find out as much as they can abuey can about the context in a short first burst of discovery, but without wwithout worrying about not understanding everything.

You, that You, that is, the collective "team you," will need to stop researching anarching and let your tacit understanding of the problem help you come up vcome up with design ideas, creative leaps, and first solutions. Prototype as cotype as quickly and roughly as possible, just enough to communicate municate each concept to one another. Then evaluate the designs. They gns. They are most likely really bad solutions, so try again. If the ideas seer ideas seem a little better next time, you can make the prototypes a biotypes a bit more descriptive. Perhaps the evaluation this time will be with erbe with end users as well as your peers. That will probably be a shock: "Whhock: "Why don't they think more like me?" Try again! Prototype earlyotype early and often, making each iterative step a little more realistic but mstic but minimizing the time and effort invested each time, relying instead ng instead on the learning that feeds your subconscious each time you try. A you try. At some point you will know that you have arrived at a good desigood design, both from your shared intuitive judgment and from the way n the way the people who are evaluating your attempts react. When their resen their response changes from critique to involvement in the result, you canlt, you can start to hope that you are on the right track.

Designing a New Version

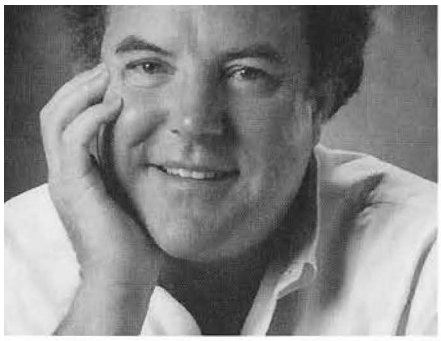
If you are designing a new version of something that already exists, "state of the art" is the most useful starting point. The chance to set a precedent with something completely new is rare. In most cases you are designing a new version of something that is already there, so you can research what has been done before, learn the lessons from previous attempts, discover guiding principles, and extract knowledge from the precedents. There is design wisdom out there, but it takes time to shake out.

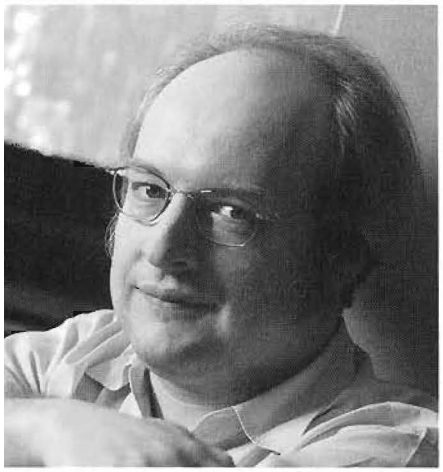
Thinking about the people that will use the design is just as important, and the process of working through iterative versions of your solution with prototypes and evaluation will still be the best and fastest way to get to a good design. The difference is that you need to spend more time and effort understanding what has already been done in the first place, so that you are building on the state of the art rather than trying to reinvent solutions that others have developed before. The research phase that comes before the first design solution or creative leap must be thorough; your team must catch up with everything that has already been done.

If you are designing a new version of something that already exists, "state of the art" is the most useful starting point.

Look at the competition, try the previous designs, research the literature, understand the design principles, compare and criticize alternative versions, get to the point that your shared mind is so full of the existing designs that you can drop them back into your subconscious, and know that whatever you come up with will automatically build on the past. Once you have reached that state, you can move back into the iterative design process of thinking about other people, coming up with an idea, building a prototype, and trying it out.

I hope that this book is in itself a good summary of the state of the art for designing interactions and that the collection of interviews will help you discover relevant constraints for your design contexts. When I look back at the material, I am conscious that it takes time to establish a state of the art. The chapter about designing services has very little in the way of notes referring to





- Bruce Tognazzini
- Jakob Nielsen
- Don Norman

well-established principles and knowledge of the subject, because at time of writing, technology-enabled services are only just emerging as an opportunity area for interaction design.

In contrast to services, the design of the personal computer has had time to mature, and there are plenty examples of well-expressed explicit knowledge on the subject. The first two chapters tell stories of the emergence of the dominant designs for personal computing, through the accounts of a few of the people involved. The state of the art for designing interactions with personal computers has been developed by many more people than these. There has been time since the creative confusion of the original invention to articulate the user interface design principles clearly and simply. Take, for example, the work of Bruce Tognazzini, who has explained "The First Principles of Interaction Design," by listing twenty-two principles on his Web site.[28] Bruce founded the Human Interface Group at Apple, where he wrote and performed for the video "WorldBuilder"—expounding the design principles for Macintosh software. He went on to Sun and is now with the Nielsen Norman Group.[29] He has published two books[30] on interaction design, making him a "must read" for any designer who wants to work on screen behaviors for desktops. This set of design principles and constraints is wonderful for us now, but it took a long time to articulate after the original innovation achieved by Larry Tesler and Bill Atkinson. And, by the way, the other members of the Nielsen Norman Group have done a lot to clarify the constraints of interaction design. Jakob Nielsen is known as the guru of Web page usability, and Don Norman has done wonderful work bringing an awareness of usability issues to the design of objects both physical and digital, from "The Psychology of Everyday Things"[31] to "Emotional Design."[32]

These are just a few of the luminaries who have helped designers, and those people who are affected by the designs, to understand more about the new constraints of designing interactions. Their contribution is essential to developing the new design discipline to a level of maturity that has an accessible state of the art and allows it to be learned, taught, and practiced on a larger scale. The work of these people, and of many other

members of the HCI community, helps us lift our understanding from the subconscious to the conscious level. It gives us a state of the art to draw upon, so that our process begins with a fast start.

Elements of the Design Process

WE CAN GENERALIZE the interaction design process with these ten elements: constraints, synthesis, framing, ideation, envisioning, uncertainty, selection, visualization, prototyping, and evaluation. They will often be used in the same sequence, and repeated iteratively, but the most productive process is usually out of order; it can sometimes seem almost random. Remember that pinball machine analogy.

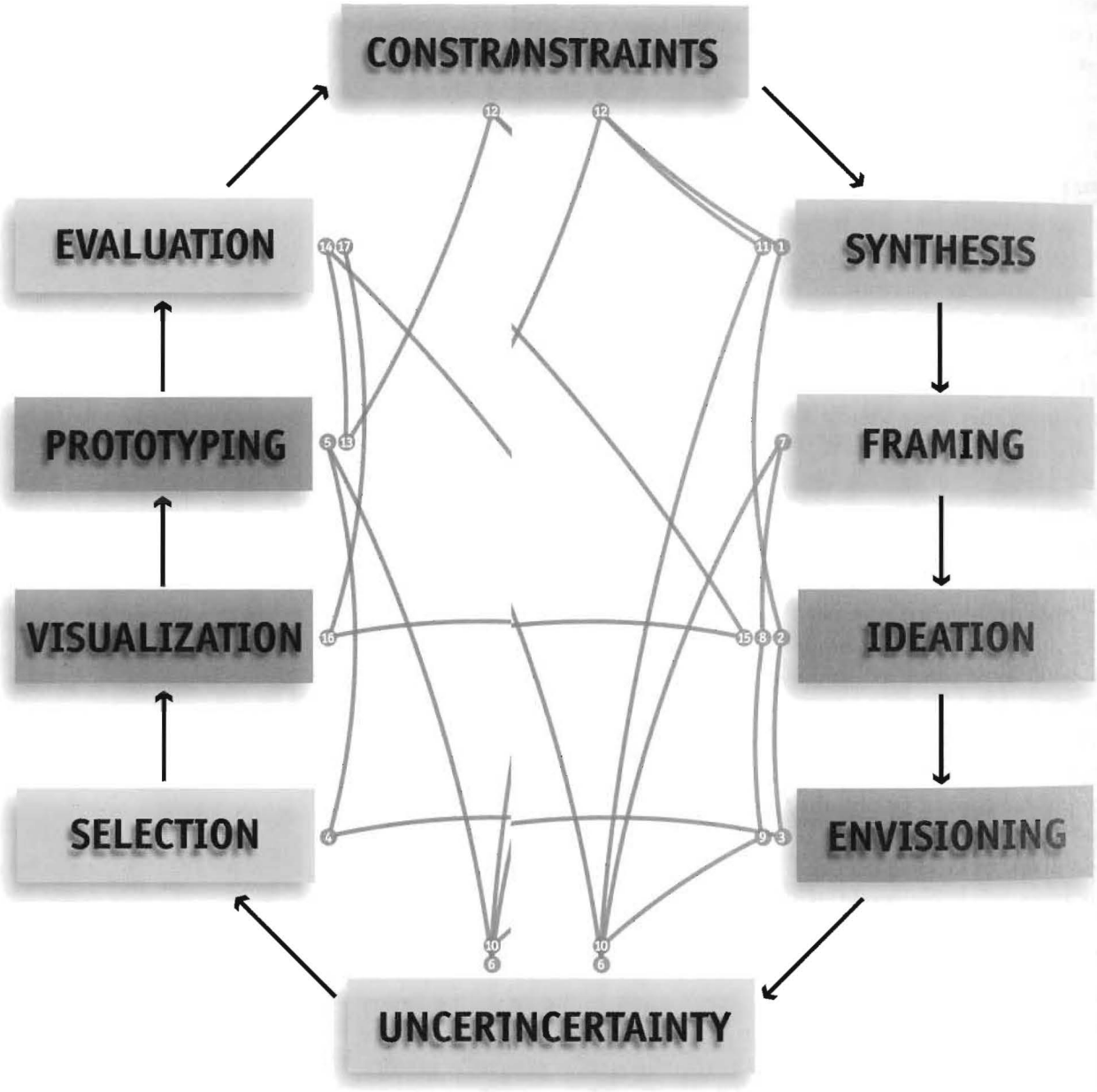
The fastest progress toward a successful design will be made when these elements are used quickly and repeated frequently, but usually not in the same order!

Constraints

Understanding the relevant constraints starts the process. The constraints come from everywhere that matters to the project. The "State of the Art," the needs and wants of the users, their preconceptions, mental models and expectations, brand awareness, functional constraints, technology, environment, financial constraints, business constraints, competitive analysis, conversations with relevant people, briefing discussions, brainstorms, and on and on—everything that could be important. The constraints must be absorbed by the subconscious mind of the designer or designers. If the context is complex, a design team is more likely to succeed than an individual, so the "shared mind" of the team will be entrusted to absorb the information.

Synthesis

Synthesis occurs as the subconscious, shared mind of the design team (or the designer if the problem is simple) absorbs all of the relevant issues. The ability of the team members to synthesize ideas is an essential skill of design thinking. The ideas may be about design solutions or other elements in the process, such as a framework or the nature of an experiment or prototype. The tacit



The dark arrows show a general tendency towendency toward a cyclical process, with the color coding of the titles indicating activities of similar types.milar types. In real life, as is illustrated by the project shown in the green sequence, the pattern is conattern is complex and less orderly than a clockwise cycle.

understanding of the constraints allows the subconscious background processing of information to be happening all the time. This background synthesis explains why people who work in design teams often come up with significant ideas without knowing where they come from. They say, "I had this idea last night," or "I suddenly realized as we were talking . . .". Because it is subconscious, the element of synthesis is not usually mentioned in explicit descriptions of the creative design process. It is vital to success, however, and needs to be appreciated, planned for and enabled. A successful team will feel relaxed enough to synthesize well, but a stressful atmosphere can get in the way.

Framing

Framing articulates the synthesis simply enough for ideas to happen. A framework is in itself a form of synthesis, in that it clarifies the issues by applying insights that create the first level of order from the chaos of all the constraints. It is not a design idea but forms a way of thinking about and evaluating possible design ideas. Coming up with the right framework for a particular project is also a design process, involving many of the other elements described here. One project may be best framed by a journey through the experience, another by a four quadrant analysis of people's attitudes, and another by a nested hierarchy of attributes. The diagram opposite is in itself an attempt to frame the design process, by showing both a generalized likelihood of a cyclical iterative pattern and a specific example of a much more chaotic individual reality.

■ An iterative process that tends to be cyclical but in practice is flexible and pragmatic

Ideation

When the ideas start to arrive, they are not always great ideas, but they seem to the design team (or designer) to have an "Ah ha" quality when they are first thought of. There are multiple levels of design ideas, some of them encompassing the whole context and others about tiny details. If a good framework is in place, it helps to position the pieces, but ideation happens throughout the process, not just between framing and envisioning.


KIDS
ROLA TUBE
BOLLARDS

Brainstorming can give a fast start to ideation and is often most useful early on, as the constraints are being shaken out. A typical brainstorm at IDEO has eight to ten participants, with one or two experienced recorders, dubbed scribes, who record the ideas as they flow from the group. Each session lasts about an hour, and 50 to 100 ideas are recorded. The conference rooms have the rules of brainstorming printed along the top of white boards, to remind everyone to defer judgement, encourage wild ideas, build on the ideas of others, stay focused on the topic, and to keep to one conversation at a time.

Ideas can come at any time, often from unexpected directions. The cycle is often interrupted by a great idea, triggered by an other element in the process. If there is consensus among team members that a new idea has value, it is usually worth stepping back from the process and going back to first principles to help decide what to do next. A good idea can cause a process reset.

Envisioning

Ideas are like dreams until they are visualized into some concrete representation. The representation can be any sort of description of the design, whether visual or behavioral, or a combination. You can use shortcuts when you are communicating to team members or peers, but there must be enough clarity in the representation that you know something of what the design is like. The journey from "head in the clouds" to "feet on the earth" can be sudden and traumatic, as it is the envisioning process that helps you immediately see what the idea is really like. Self-delusion is no longer easy.

■ Brainstorm at IDEO

Photo
Roberto Carra

Uncertainty

Deep uncertainties are likely to follow envisioning, or visualization, or prototyping for that matter, as you analyze the potential of the solution. The design process is good at generating alternatives and making them realistic enough to evaluate in some way. Uncertainty is a necessary factor as a precursor to selection.

The subconscicsubconscious "shared mind" (or individual mind) is now busy synthesizing unesizing unanswered questions about the validity of each of the alternative alternative ideas. Is it simple enough to understand? Is it consistent withistent with what came before? Can it be made to work quickly? Therekly? There are always plenty of uncertainties that are worth trying out. ıg out.

Selection ɔtion

It is time to chotime to choose. A manageable number of alternatives must be chosen to take en to take forward to the next step. When a creative team is working well, tking well, there are nearly always too many good ideas, and you have to bhave to be firm in choosing the most promising group, without feelingout feeling too bad about the need to reject the rest. Lively differences of rences of opinion and discussion are normal during this process, unless ess, unless a clear leader is entrusted by the organization to take the decisicthe decisions.

Visualization alization

The visualizatic visualization element is closely related to both envisioning and prototypinprototyping. It may be a small step from the representation envisioned earlisioned earlier, or it may be taken a lot further. The difference is that envisionit envisioning implies a glimpse into the nature of an idea, but visualization is dlization is more complete as a representation; it should b convincing as incing as a communication of the potential reality of the concept. visualiept. visualization implies a representation that is perceived by the viewer as reiewer as realistic but may at the same time be dysfunctional. This is in contr is in contrast to a prototype, which always looks to test some aspect of functist of functionality. For screen-based experiences, sketches are often useful. Fo useful. For behaviors, some kind of script will be wanted. I use the word "he word "visualization" broadly, implying more possibilities than the merelythe merely visual.

Prototyping ɔtyping

Prototyping is ɔtyping is about testing any aspect of the way a design is expected to wcted to work. You can create a prototype that represents an idea that has bthat has been selected and visualized. Alternatively, you can

test any uncertainty and come up with the simplest and quickest form of prototype that will allow you to examine it, to decide whether to move forward with that aspect of the idea, or to drop it and try another approach. As the iterative cycle of development progresses, prototypes tend to get more holistic and inclusive. In the early stages you are looking for the roughest possible prototype to help you clarify an uncertainty, but as you approach the final result, the prototype looks more and more like the intended design. The final prototype before release for implementation is likely to include realistic interactions, both for behavior and appearance, which can be tested for evaluation and approval.

Evaluation

In practice, evaluation is needed many times during the development process. In the early iterations, the choices can be made quickly by the team members themselves, or the captive "clients" who are assigned to the process. As the design matures, more complete prototypes are likely to be relevant, like the experience prototypes or the live prototypes that we have talked about, in which case a more thorough and structured user evaluation will be worthwhile. The results of the evaluation can form a new state of the art for the next attempt to create a good design, so the addition of the results to the package of constraints can trigger a new cycle of design development. When you are getting close to a good design, the evaluation process is more likely to yield minor adjustments. By this time it is too late to go back to first principles, but evaluation still helps the design team avoid the pitfalls of narcissism. A good motto for designing interactions is to evaluate early, often, and as late as possible.