OPENING KEYNOTE

ON MODELS
HUGH DUBBERLY

Wow, I couldn't be more honored. I'm really, really glad to be here.

I want to thank Rick for that very flattering introduction. I'd also like to thank Maria, Luis, and Rick for inviting me here.

I want to talk about why I believe models are crucial in designing and in research.

I want to begin with three embarrassing admissions. First: Design is stuck.

And by that, I mean we don't know how to make progress as designers. As an example of that I want talk about the AIGA National conference in Boston. The first conference was in 1985. AIGA is the American Institute of Graphic Arts. It's the main professional organization for graphic designers. Wonderful conference. Milton Glazer came and spoke. Brilliant graphic designer; gave a wonderful talk; showed some really great work. Nicholas Negroponte was also invited, and he came and talked about the work of the Architecture Machine Group and the just forming Media Lab.

Twenty years later, the AIGA national conference was in Boston again, and Milton Glazer came and gave another wonderful talk; showed some really beautiful work; and talked about being deeply involved creating change in the world. Nicholas Negroponte came again, and he talked about the OLPC, the one laptop per child initiative, and he showed some really great work, too.

But I came away from that talk surprised by how little design had changed in those twenty years and by how much technology had changed in that time. Perhaps, the main change in design was its adoption of technology.

I think we can do better.

Most disciplines have well-established structures for building and sharing knowledge. Here's a structure where we have people doing research. The research is reviewed by peers. It goes into journals. There's a feedback loop, which helps people get tenure, and there's also a feedback loop, which helps get sponsorship. This is a rough model of something much more complex that many of you are familiar with. Many of you participate in this perhaps.

Design doesn't have this. What we have is a tradition, which goes back before the academy; it predates the academy. It is a medieval practice still. We have apprentices; we give them critiques. Very occasionally some of us write papers and present our findings, and they go off into the ether or the Ethernet.

Almost twenty years after awarding the first PhD in design in United States, we still have not agreed on what design research is. What design research is is still the subject of conferences.

On Models – Dubberly

We don't agree on what design knowledge is either. In fact, many people question the very notion that there is such a thing as design knowledge.

But if being stuck weren't bad enough, design is stuck in a bad place. This is the second embarrassing admission: We don't know how to make successful products. John Cain says we know how to make successful products, we just don't know how to make them regularly.

What I mean is that at a deep level, we don't know how to do this. Even Apple and Steve Jobs are not always successful. Anyone remember the Apple III, Lisa, Newton, the Apple QuickTake? That was the first consumer digital camera ever released. I worked on these last two; so I know what I'm talking about when I talk about failure. E-world, anyone remember that? It used the technology on which AOL was based. Apple had it; sold it to AOL; and licensed it back. There's a business model. [laughter] Steve Jobs has made a series of cubes; he has a thing about them; and he doesn't give up. [laughter]

Product Management, the art of making successful products, is rarely taught in design schools or business schools. It's a little bit like a fly ball dropping between the center-fielder and the right-fielder.

The people who make products don't agree on how to do it. Who manages the schedule and the budget? How do you determine requirements? Do you need requirements? Do you start with requirements? Do you start somewhere else perhaps? Who owns design? Who owns the spec? Who can say, 'No'? Who can say, 'Yes'?

Often, the official process isn't what actually happens. The product requirements document (the PRD) is barely begun, but the engineers already have a prototype. That's called being agile.

Agile processes work well in small start-ups, building products for people like themselves. For example, 37 Signal's Base Camp. Great stuff. The 37 Signals folks are big advocates of agile development. Curious story. You know who the major investor in 37 Signals is? Jeff Bezos, CEO of Amazon. You know how Amazon develops product? A different process; far from agile. This seemingly contradictory behavior—investing in the advocates of agile but using rigorous planning—points to confusion not just at Amazon but across the industry.

What's not clear is how to achieve coherence *and* scale—how to build platforms or interlocking systems—without rigorous planning. This is a religious debate: How to build large, complex systems *and* be more agile.

We must also consider the research side of the product development process, using research to help understand people and their contexts. Design schools and consulting firms promote this idea. A few forward thinking corporations—many of you work for some of these companies—are promoting these kinds of best practices. And yet upfront research remains rare for most new products.

The value of design research is in doubt. How many of you who have seen Don Norman's article in Interactions?

"Design research is great when it comes to improving existing product categories, but essentially useless when it comes to breakthroughs… Major innovations come from technologists who have little understanding of all this research stuff." And that's what your friends are saying. [laughter]

Skeptics often cite Apple as making great products seemingly without formal research. How many of you have walked into a large corporation and proposed a research plan and had the manager say, "But Apple doesn't do this; do they?"

Great products, like Apple's, have integrity—a kind of coherence that stems from a clear product concept ruthlessly refined. Product coherence comes from vision, will, and trust. It requires system thinking of course, but the vision is the key thing. A vision of what the product needs to be and why: A vision of who the product will serve and how it will fit into their world, a vision of the technology needed, and a vision of how it will be funded.

Product visions are based on observation. Observations need not be formal research, but they must transfer—from the observer to the maker, from the researcher to the designer, from the designer to the engineer, from manager to team and vice versa.

Often that's where formal research goes wrong. It fails to transfer. It's not that the research isn't valid; it may be. Or that there are no useful insights; there may be. But rather, the designers and product managers and engineers can't connect the research insights to the product.

So: Design is stuck, in a bad place. We don't know how to make successful products, *and* whatever experience we might have is increasingly less relevant, because the very nature of products is changing, as we move into a new epoch. That's the third embarrassing admission.

We are in the midst of a fundamental shift in how we view the world. A shift from mechanical to biological. From Newton to Darwin. From industrial age to information age. From cathedral to bazaar.

This shift in world view is changing the nature of products. From hierarchal to distributed. From planned to emergent. (That's Flipboard on the right.) From completed edition to continuous beta. From objects to experiences. (I borrowed this photo from Shelley Evenson, who borrowed it from Christopher Alexander. It's important to point out, as she says much better than I can, why this photo is great. It shows the front of the house and the back of the house; it shows creation and consumption at the same time; it shows a kind of community. It shows a situation designed to create the possibility of wonderful experiences.

The changing nature of products requires new approaches to designing. From a stance of expertise and objectivity to a recognition of subjectivity. From an expert/patient view to a symmetry of ignorance. [laughter]

As Rick said, I mean this on all levels of entendre that it implies. Now I want to be very clear about this. I am making a joke, but I'm making it in the hope that you will remember a particular idea. We often forget our history. An important part of the history that we forget is that design thinking wasn't invented in the last ten years at *Business Week* or in Toronto or even in Chicago. Design thinking has a long history it goes way back. One of the heroes in design thinking is Horst Rittel. You may know him as the guy who coined term "wicked problems". Wicked problems are those problems for which we cannot agree on the problem. They are essentially political problems. Rittel posited the idea that the problems that are really important to solve in design are political problems. It's very interesting to see Rittel, a German physicist before he started to teach at the design school at Ulm, that he came to the conclusion that design is a rhetorical art, and he then brings design into the realm of politics. In addition to this notion of wicked problems he also coined the phrase "symmetry of ignorance" to talk about the condition of those engaged in solving a wicked problem. He said the constituents in this process share a symmetry of ignorance. Or a symmetry of expertise, which is a little less dramatic. Rittel's point is that all of the constituents of a political process—or a design project—share the same level of ignorance or expertise, with respect to the goals of the project.

There's also a change in practice from this notion of an author—here we have a painter in the studio—moving from author to facilitator. This notion is not comfortable for many of us as designers, this idea that our job is to be a facilitator. And finally, we are moving from perfecting to creating conditions in which things can grow. Also perhaps not comfortable.

We can no longer focus on the form of static objects alone. Not that form isn't important. Of course it's important, but it's not the only thing. We must also create conditions in which ecologies can flourish. We're moving here from the form of objects in the lower left corner up the X-axis to thinking about not just form but also structure and context, and on the Y-axis we're moving right from individual artifacts to systems to systems of systems or communities or ecologies.

I have outlined three very difficult problems. What's the solution?

I believe the solution is models—not the only solution by any means but an important part of the process.

How can we build knowledge in design practice? I believe one way to do it is by collecting and sharing models.

How can we make research accessible? I believe one way to do it is by collaborating on building models.

How can we cope with the increasingly intangible nature of systems and services that we are called on to design? I believe one way we can do it is by modeling these systems and services.

All of that begs a basic question: What is a model?

A model is an idea about how part of the world works. Representing the idea aids its refinement. Here, I am suggesting that models are essentially mental constructs. Those of you who are interested in

linguistics and semiotics will no doubt see that I have used Pierce's triangle. I am suggesting that a model is a form of a sign.

"Models are also voodoo dolls. We do most of our thinking in models." I have Alan Kay, famous computer scientist, on tape saying this.

Now, let's look at a few examples from practice.

The first is a quite famous model from Rick Robinson and John Cain and their time at E-lab, the phases of a cold. GAC is getting a cold. HAC is having a cold. GOAC is getting over a cold. This model is really wonderful. It shows how people think about the progression of something that happens to them over time. Rick tells a story about how this model created a possibility of organizing and selling cold medicines in a new way. These categories had not been ones which the cold medicine companies had previously used.

Let's move from a model of getting a cold to a model of health. I'm going to attempt to explain this. We mostly think of health in terms of illness—in terms of acute care medicine and other therapies administered by HCPs with patients' consent. There's also chronic care where the patients may not do what the doctors say to do. There's self-management, people actively involved in their own monitoring. These are goals at one level, and they're also the means to other goals at the next level. Healthcare is a means to health itself. Health isn't just lack of illness. According to the World Health Organization, health is also complete physical, mental, and social wellbeing. Health itself is merely a means to another level of goal. Health is the means to the goal of quality of life.

The health goal ladder was a kind of context to another model of the direction that healthcare is going in a connected world. On one hand, we have sensors measuring health markers. On the other hand, people are taking actions in their daily lives, which change their body. These changes are sensed, closing the loop—and creating the possibility for self-experimentation, for experiments of where n=1. Family and friends and health care practitioners can be brought into this process, creating a new type of self-management—a new type of chronic care. Imagine the Quantified-Self folks plus Facebook plus University of Phoenix. If you imagine Quantified Self, Facebook, and University of Phoenix in this kind of mash-up you get a sense of one direction that management of health and wellbeing might take. This model provides a framework for thinking about new products and services.

Here's a model trying to explain to a large consumer electronics company why great physical product design is simply not enough anymore, why great physical product design is simply table stakes, that iPod is not merely a beautiful object. I'm sure this is obvious to all of you, and yet engineering firms, manufacturing firms managed by engineers, who rose to where they are, who rose to manage great brands, world famous brands, they have a very difficult time seeing that Apple is not just a consumer electronics hardware company. They have trouble seeing that iPod is an integrated system of hardware, software network services and communities.

Next is a model we created for Samsung. We did this in 2006. These are all the products that Apple made. At the time, it was clear that Apple was going to make a phone. But my goal was showing

how the iPhone would fit in with the rest of the Apple system—showing that iPhone wasn't just a standalone piece of hardware but part of a growing network of services.

Those were a few examples of models. Now, I want to propose a challenge. I believe we are at a point when it is possible to ask this question: What set of models is necessary and sufficient to describe a new product?

We should jointly be engaged in figuring this out. I have listed some models here: a user opportunity and need model, a model of primary user tasks, a competitive space and positioning model. (Perhaps these are two different things, although they are related.) A model of a solution space, a model of the system that you are proposing to build, an application architecture, a network configuration. (These three are related but perhaps different.) For those of you engaged in making software, a data model is absolutely essential. A business model, projected run rate model, organizational structure (official and actual), project development process (again official and actual), manufacturing process, distribution process, release and marketing plans.

I think these are necessary. I'm not claiming that they're sufficient. I have arrayed them around this famous model (What do people desire? What will sustain a business? And what can we build?) to suggest that these models support this larger effort of making a successful product. These models are the product of a conversation between the members of the product team and the folks that they hope to serve.

Without modeling, research and design will not be effective.

Saying that one understands a system, is saying that one has a model of the system. No model: no real understanding.

Understanding implies an ability to accurately predict behavior. No model: no predictions. The system remains a black box.

Understanding implies an ability to manage. No model: no management.

Understanding implies an ability to debug. No model: no debugging.

Understanding implies an ability to communicate. No model: no conversation. And this I think is the point, the fundamental point: Models are explained by stories. Stories create models. Models and stories are tools for thinking. Models and stories are tools for discussion.

So how do models work in design and research?

I propose here, not for the first time, a model of modeling. Designers bridge the gap between what is and what could be. Or what should be. I have a long-running, friendly debate with Shelley Evenson about this. Rick has been involved, and I have won Rick over to my side. It goes back to the discussion about Rittel. I agree with Shelley that we are engaged in figuring out what could be, but we

must also go the next step to help figure out what should be. I say this to reinforce the notion that what we are engaged in is fundamentally a political activity.

Shelley and Rick and I published an article in ACMs *Interactions* about this model, describing models as tools designers use to bridge between what is and what should be. I want to explain the model briefly. The left column represents now, existing, implicit, current. The right column represents new, preferred, explicit, future. As they say in Maine, "You can't get there from here, at least not directly, except in a craft tradition. That is what craft is about—going there directly. But in the complex world that we are in today, where we are engaged in building systems which are intangible, services which unfold over time, or the intersection of systems and services, or complex platforms which are systems of systems, ecologies, communities, marketplaces, platforms, languages. These things require a level of abstraction. We must move from describing to interpreting, from concrete to abstract. A kind of framing happens, a framing of what is here that leads to a set of models and almost immediately as you start to frame what is, you also begin to frame what could be, and you actually frame how you are thinking about what should be. These arise together. Donald Schön has a great article in which he describes this process of framing design problems.

We published this model in 2008. It began for me a process of collecting models. It is my way of trying to unstick a little corner of design. Design is not advanced enough yet to move into a theory-forming phase. We are a little bit like natural science in Europe, particularly in the UK, in the middle of the 19th century. Then, scientists wandered around the UK collecting rocks. These models are my rocks, my collection. From these collections and others like them, we will be able to build knowledge.

It turns out that this model is shared by a lot of people. The article grew out of a talk, which Rick gave not far from here at an AIGA Conference called Image Space Object. He talked about Clifford Geertz's notion of "deep play." I later remembered that Rick and John had developed this model much earlier in the formation of E-lab or perhaps even earlier than that. It's essentially the same model. And so I think we all owe a great debt to Rick on many levels, but this is one of the most important, and it is a great shame in design that designers being from a pre-academic tradition don't understand what it means to write, don't understand the importance of citations, and so many of us use this model without even understanding its origins.

There are some antecedents. Stafford Bear has a model that talks about how managerial situations might be likened to scientific situations. Christopher Alexander has a model, which is somewhat similar, talking about the transition from a craft tradition to a design tradition. Vijay Kumar at the Institute of Design has elaborated on this. Kaiser and IDEO have one. Jane Fulton Suri has one. Recently at a conference, Bill Verplank came up to me having read an article about this and said, "Hey you know I had a version of something that's quite like this." Jump Associates, some ID alumns, have one. Joanne Mendel has one.

And here is an interesting one from Sara Beckman who teaches at the Haas School of Business at UC Berkeley. She comes out of a different tradition, an emerging tradition looking at the relationship between design and business. There's a clear connection between what Sara's showing and Rick's model. She also brings a new strain of thinking, and so I want to draw another connection.

There's a set of models from the world of knowledge creation, which look at learning as bridging the gap between tacit and explicit, and going back then from explicit to tacit. In particular, there is a model from Ikujiro Nonaka called the SECI model (Socialization Externalization Combination Internalization). He uses this model to describe the learning process—the knowledge creation process in organizations. He talks about moving from tacit to tacit. This is what I was talking about earlier in graphic design—in much of design—where we have an apprentice-master model. This tacit to tacit movement is the apprentice watching the master and tacitly picking up knowledge. I'm suggesting that we also need to be moving from tacit to explicit; that is, explicitly articulating what we have learned tacitly. The next step is to move from explicit to explicit; that is, to build on what we have learned. And then—and this is perhaps the difficult part—to move from the explicit back to the tacit—to embody the new knowledge we have created.

What was surprising to me, was finding myself helping a graduate student with a paper, reviewing his paper, and he said, "Of course you know about the SECI Model. You're the model guy. How could you not know about this? And I said no, don't know about this." This was a Brazilian business information student who was writing a paper for *Touch Point*, the journal of the Service Design Network. What surprised me was that these models are isomorphic. They have the same structure. They are essentially the same model.

Now this is a long way to go for a small point that most designers understand intuitively—designing is learning.

And yet, there is something profound in that point. We can see a structural similarity. We can make it explicit. We can tell a story about it. And that is more powerful than simply saying, "Well of course design is learning." We can, in telling the story, say *how* designing is learning.

There are other, similar models of learning, a tradition. Kolb talks about experiential learning. Tennant talks about learning styles, McCaffery talks about experiential learning cycles.

I want to finish by talking about models as a form of boundary object. Models are artifacts that bridge the gap between disciplines. I'm sure many of you know Susan Star's paper where she talks about boundary objects. I want to read this, pardon me. "Most scientific work is conducted by extremely diverse groups of actors. Simply put, scientific work is heterogeneous. At the same time science work requires cooperation—to create common understandings, to ensure reliability across domains, and to gather information, which retains its integrity across time, space, and local contingencies."

> …boundary objects are produced when sponsors, theorist, and amateurs collaborate to produce representations of nature. Among these objects are specimens, field notes, museums, and maps of particular territories. Their boundary nature is reflected by the fact that they are simultaneously concrete and abstract, specific and general, conventionalized and customized.
>
> Scientists have made headway in standardizing the interfaces between different worlds … by reaching agreements about methods, different participating worlds

establish protocols, which go beyond mere trading across unjoined world
boundaries. They begin to devise a common coin, which makes possible new
kinds of joint endeavor.

Let me repeat that, "They begin to devise a common coin, which makes possible new kinds of joint endeavor."

We need new kinds of joint endeavor. We need to build bridges between research and design. We need to build design knowledge. We need to create great products. We need to build systems and services. We need to build more models.

I want to specially thank Shelley Evenson, whose thinking permeates this talk; although I'm responsible for the errors; Michael Gallagher, who did the graphic design; my long-time collaborator Paul Pangaro; John Cain for his thoughtful critique, and of course the inimitable Rick Robinson.

Thank you very much.

QUESTIONS

Moderator: So if we have a question or two for Hugh right now, we can take that or you can consider questions, and after one more short interlude, we'll go to the break. Question? Can you go to the microphone please?

Speaker: Hi, I'm a PhD student working actually measuring boundary objects and visuals to tap into a discipline, multi discipline.

Hugh Dubberly: This is what I was afraid of, that there would be experts here.

Speaker: No actually I follow your papers. So what I was wondering is how do you use the component of visual literacy, because that is something I run a lot into when I meet with other disciplines, and they just like, yeah you are designers. You make graphic designer stuff; so you understand visuals. We don't have like,… I know all the cognitive value that models have for example common efficiency, retaining. We are more exposed everyday to tools like visual models, but how would you answer the questions. Are other disciplines ready to work with models in a visual way? Thank you.

Hugh Dubberly: Absolutely. Other disciplines can and do use visual models.

I can offer this thought. A list is not a model. But it's great to start with lists. When I teach students to make models, I give an assignment called the baseball problem. I ask them to make a model of baseball. We begin by making a list of all the elements of baseball. It's important to move quickly to understanding the relationships between the items in the list. It's important to think about

how they form a kind of network. That network may have some hierarchies in it. There are multiple possible structures. Representing those is important.

I often tell design students that you will go into the business world, and you will find yourself in a meeting, and you will think of the movie, *Ground Hog Day*, that I have been in this meeting before, many times, and you should take action. And the action that you should take is to jump to the whiteboard and say, "I hear you saying this." And then you should draw out the nodes and the links so that people can see them. And you should say, "I think this is probably wrong. But help me debug this." And by doing that, you will take the conversation from *Ground Hog Day* to making something that we can see and discuss and iterate. You've captured the idea; it is no longer fleeting.

So that's my advice.

Break?

Moderator: Yes.

Hugh Dubberly: Thank you.