DESIGN

Design Behaviour

Selective Emergence

Fitness

Information Flow

Design is never done

Faster Iterations

From Blueprint to Genetic Code:

by
Tim Brown

The Merits of an Evolutionary Approach to Design

Like everything else in life, design is evolving, forcing us to give up the very essence of the Newtonian notion of design: the blueprint.

LIKE MOST DESIGNERS, I am quite comfortable with the notion of designing simple things. I can pick up just about any object and tell you how it was made, and I could probably have a reasonable crack at designing an equivalent of it, even though I'm not a particularly technical person. That's because it is possible to definitively know everything important about a simple object: we can know its form, the market for it, and the best method of manufacturing it. We might even know what to do with it when people are finished using it. The traditional design process entails figuring all of this out beforehand and 'making it so' in the world.
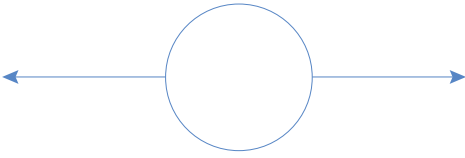
Unfortunately, as the world's problems have become more complex, the traditional design process has been challenged. Many of the products and services created today are more like complex systems than simple objects; they often involve a confluence of software, hardware, and human behaviour. And as systems evolve, so must our knowledge of systems design.

Take urban planning, for instance. Look around your city and you will see countless examples of the unintended consequences of a failure to understand a complex system. That's because a traditional design process was likely used to create the sub-par products and services, and cities are like organisms – they evolve. It is very difficult to create a 'planned' city, as Chinese leaders are currently finding out through their attempts to create fully planned, top-down, large-scale cities.

In traditional attempts to design a service, we 'script' the service, creating a 'user experience blueprint' that attempts to describe everything that will happen to the customer during the experience. For a hotel, for instance, this would include everything from what the lobby looks like to what the check in service is like. Attention to all these details leads to a relatively complicated script, which makes us confident that we have covered all the bases. The problem is, even when we get these scripts right, it's amazing how often things go wrong.

From Newton to Darwin
As designers become more involved in solving the world's wicked problems, an ability to deal with complexity becomes all the more important. In my view, this indicates a paradigm shift for the world of design, because it demands a shift from thinking about the world in the way that **Sir Isaac Newton** encouraged us to think about it, to the way **Sir Charles Darwin** thought about it. Let me explain.

Newton's world was based on the assumption that we have an ability to predict the world based on actions in the present. When we think this way, it encourages us to be top-down in our activities, to be predictive, to believe that we can imagine a complete system. I would argue that the complexity we often face today requires us to think more like Darwin, who encouraged us to think about constant evolution, emergent change, and the notion of unpredictability on a large scale, even if we understand things on a small scale.

As designers and as leaders, I believe that we need to start emulating Darwin a bit more and to stop emulating Newton. Following are some possible aspects of a more Darwinian approach to design.

1. We should give up on the idea of designing objects and think instead about designing *behaviours*.
Behaviours are about the interrelationships between people and the objects that exist in the world around us. To illustrate the difference between designing an object and designing a behaviour, take a look at this image:

This sign can be found on trains in Europe – a vain attempt to encourage the male of the species to create less mess in the public toilets. But because it is simply an instruction, it doesn't work very well; anyone who has used a train toilet knows all too well the degree to which it doesn't work. About 25 years ago, the fellow who managed the airport in Amsterdam had a much better idea:
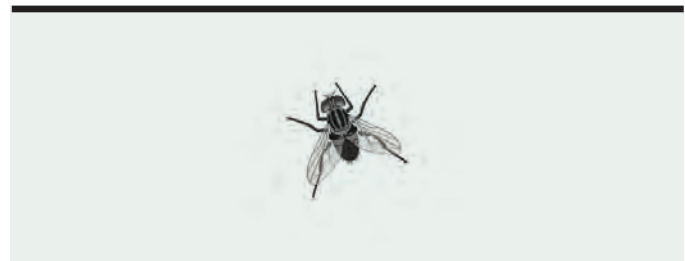
He realized that if you printed a fly on the urinal – in just the right spot – you would give people something to aim at. And when you give a man something to aim at, he actually does a remarkably good job: this approach has reduced the mess in urinals by up to 80 per cent. That's what it means to design a behaviour.

2. We need to think more about how information flows.

If you talk to people at the **Santa Fe Institute**, or read any of their books, you will learn that a key characteristic of a complex system is that the more complex a system is, the more information flows through it. If this is true, then we ought to be thinking more about these information flows when we are designing complex systems. In fact, before we work on designing a better solution, we need to get better at understanding the complex system *as it is today*, and what information is already flowing through it.

For example, Harvard's **Nicholas Christakis** has studied the relationships between people with respect to their health, and one of the conclusions he has come to is that if you are in a network of obese people, you are *three times more likely* to be obese yourself. Conversely, if you are in a network of non-obese people, you are three times more likely to *not* be obese. This is a very important insight for design: that the behaviour of those around us significantly effects our behaviour. Intuitively we might know this, but we don't necessarily always think about it when we're designing systems.

3. We must recognize that faster evolution is based on faster iteration.

The faster we do things, the faster we learn and the faster we improve. The natural world deals with this truth very well. The reason viruses evolve so fast is that they reproduce every few minutes, which is why we have such a hard time keeping up with them. In contrast, humans evolve (i.e. reproduce) every 20 years or so, and in general, business is more like humans than it is like a virus. How can we make a business more like a virus? One way to move in this direction is to accept that we cannot know all the answers before we do things.

We recently worked with **State Farm Insurance** in the U.S. to launch Next Door, which provides coaching and financial advising to a new generation of customers. Next Door is a place for customers to come and learn about insurance and financial services, and at the same time it's a place for State Farm to learn about them. The idea that we can launch things *simply to learn from them* is quite useful when we're thinking about increasing the reproductive pace of iteration in business.

4. We must embrace selective emergence.

So far, natural biological systems appear to be way ahead of us in dealing with complexity, but we do have one advantage over them: with biological systems, all of the improvements are random – they are based on mutation. There are some *guiding prin-ciples* perhaps, but there is no *guiding intelligence*. We humans have the benefit of potentially using the best of both when we design something.

There are technologies out there that are already doing this – enabling us to use the idea of selective emergence to rapidly iterate things while nudging and guiding them towards some outcome that we want. For example, 'genetic algorithms'. In software today it is quite common to build algorithms that reproduce themselves; certain rules are applied, but you don't know in advance what the optimal version of that piece of code is going to be. Evolution gets you to it, and all you've done is apply certain rules to nudge it in the right direction. This idea can be applied in fields as varied as engineering, design and art.

The strange looking thing pictured below is called a *strandbeest*. These remarkable structures were created by Dutch sculp-

tor **Theo Jansen**, and you can find them walking up and down the beaches in Holland. Made out of PVC plumbing pipe, they are 'self-articulating' – they move on their own. Jansen used a genetic algorithm to create the 'hip' and 'foot' joints. He didn't know in advance what the right ultimate solution was, so he designed an algorithm and it kept iterating and iterating until it created the most efficient foot and hip mechanism to make these sculptures walk on their own. I believe we should be using this approach more often in design. We are already seeing it done in architecture, where architects use a similar kind of technology to create the facades of buildings – the ones you see that often look much more organic than a traditional structure.

As designers, we need to remember our relationship with science a little bit more. We're often very good at exploration
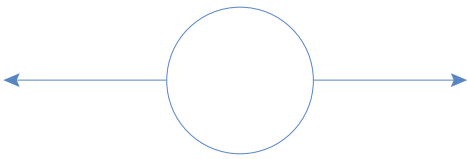
or divergence – asking questions without any real sense of a hypothesis. But I think we also need to relearn some good scientific methodology. Doing so will enable us to ask more of the right questions, come up with better hypotheses, design effective experiments and most importantly, share our learnings.

5. We need to focus on fitness.

Biological systems naturally focus on fitness; at its core, that's what evolution is all about – striving for fitness, whatever the environmental context might be. All kinds of biological systems do this; but what is the equivalent of fitness in business and in design?

I believe one way of thinking about fitness in the organizational realm is the concept of *purpose*. Organizations that have a clear purpose tend to be able to design in a less top-down way. Many years before **Apple** took over the world, **Steve Jobs** spoke to his people about "being insanely great," telling them: "What you create has got to be so good that you are shocked that you could actually create something that good." This became the driving purpose of the organization, and it allowed many more people to contribute to the greatness of Apple than would have been the case if there were no such purpose. Imagine an organization that didn't have this purpose, but still had a Steve Jobs in it; it would have been impossible for him to achieve what he achieved. I believe that his incredible vision *plus* an organization that believed in the notion of being *insanely great* are the keys to Apple's success.

6. We must accept the fact that *design is never done.*

In the architectural world, there is a notion of 'life after the open house.' Architects see all sorts of perfect photographs of buildings just at the moment when they hand it over to the client, but very rarely does anyone see photographs of what happens afterwards. I think this is natural, and I do the same thing: I design a product and I take a perfect picture of it, before the manufacturers get their hands on it, never mind the user. This is that moment when the 'thing' is closest to my vision, and it's when I think I'm done with it. Of course, this is a ridiculous notion, because in truth, it is now in the hands of users, where it will be adapted and used for things that I didn't expect it to be used for.

In the world of video games, particularly in online games like *World of Warcraft*, design is going on all the time. Yes, there is an environment that was created, but the design of behaviour – of the events, the characters – all of this is done by users who are, in effect, *participating in the design*. I believe that design is going to look much more like this in the future, rather than the idea of unveiling a pristine 'thing' that we hand over to people.

Evolutionary Organizations

Embracing a more evolutionary approach to design can do more than enable us to create better products and services: I believe that we can use these ideas and principles to tackle some of the most important challenges of our time. In the field of chronic health problems, for instance, we're beginning to see opportunities to hand control over to patients and enable us to design behaviours for ourselves that help to manage chronic disease. As a result, we're starting to get past the idea that our bodies are mysterious 'black boxes'. For example, there is a scale that comes out of Europe that does something very simple: each time you weigh yourself, it sends the data to your iPhone. Over time, you can build up a clear picture of the relationship between your behaviour and your weight, because you get to see it on a graph. Such devices could measure all sorts of things, potentially allowing us to equip people with the means to change their behaviour.

Another way of changing behaviour is to put the tools of design themselves into the hands of people delivering services. We've been working for several years with **Kaiser Permanente**, teaching nurses and doctors and technicians how to use design thinking to improve patient care, and Kaiser now has its own consulting group made up of nurses who have become expert at this. They go around to hospitals working on different problems, creating wards and hospitals of the future. Already, they've had some great success in increasing the efficiency of shift changes for nurses.

At IDEO we are particularly interested in applying design to issues of poverty. While it's still early days, we are finding that the way to have the most impact is to give people tools rather than designing an end product. For example, we've been working for some time now on sanitation issues in Ghana, designing a low-cost toilet for people's homes. The problem is, even if you design the lowest-cost toilet possible – in this case, about $30 – it's still too expensive for most families. We looked at things like micro-finance to deliver the service, but what we found is that the really important design unit here was a service business model. The model allows room for entrepreneurs to set up service businesses where they rent toilets out to people and come to empty and clean them on a daily or weekly basis. The lesson we learned: the important part wasn't the design of the toilet itself, but the whole business system around it.

We recently worked on a project with the **Bill and Melinda Gates Foundation** to create a Human-Centered Design Tool Kit, which is really a field guide for design for not-for-profits and NGO's. It includes tools that enable them to understand their users

better, to create ideas through prototyping, business model design, etc., and we've had some interesting success with it. Already, the tool kit has been downloaded over 70,000 times and it is being used on projects ranging from creating a new maternal hospital in Nepal to working with a cooperative of weavers in Rwanda to water distribution management systems in Malawi and hand-washing stations in Vietnam.

In an effort to scale all of these efforts up, last September we launched **IDEO.org**, which is a sister organization to IDEO and a not-for-profit design organization that works on social innovation initiatives. Unlike IDEO's core business – where we're hired to solve problems for clients by designing new services or products – we're doing something quite different with IDEO.org: we're looking to build out the capacity for design in the social sector. This is a space where giving up control is necessary: if you want to participate and be involved in social networks – what I think of as the 'participation economy' – our old notions of designing everything in a controlled way just don't make sense anymore.

Evolving as an organization means listening to not only your clients, but to what's happening in the world around you. Our clients would often say to us, "You talk about how we should use innovation to disrupt ourselves, but how are you disrupting *yourselves*?" We thought about this for some time, and asked questions like, "What if we could solve problems collaboratively via a global network?" Basically, what would happen if IDEO had 50,000 people working on design challenges instead of the few hundred working within our walls?

We came up with **Open IDEO**, which is a platform for tackling social innovation problems. We do this in conjunction with various non-profits and sometimes with companies, as well. For instance, we teamed up the **World Wildlife Fund** and **Sony** on one challenge, and **Unilever** is helping us out on the sanitation challenge in Ghana. At the moment we have about 25,000 people in the design community working on projects in 178 countries.

We are already seeing businesses getting launched through Open IDEO, and we're seeing some really interesting ideas going back into the organizations that sponsor projects. But more importantly, we're learning a huge amount about how collaborative design might happen in the future.

In closing
Like everything else in life, design is evolving, and in many ways we are being forced to give up the very essence of the Newtonian notion of design: the blueprint, which personifies control and defining every outcome of the design process.

Instead of focusing on designing blueprints, I believe there is something that better represents what we should be designing going forward: genetic code. At one level, genetic code represents the biological view of design I have described, because it is an 'instruction set' for biological behaviour. But more importantly, it represents the idea that code is only the beginning of something: it sets off a series of behaviours, but you can't know the ultimate outcome in advance.

While most of us don't understand how to work with genetic code, we have already begun to understand how to work with a different type of code: software code. The design and engineering of software has changed quite radically in the last 10 years to be much more 'open-ended' than it used to be. In a sense, this is a metaphor for how we as designers – whether we are industrial designers or designers of businesses – need to behave and work going forward. *R*

Tim Brown is CEO and president of IDEO and the author of *Change By Design: How Design Thinking Transforms Organizations and Inspires Innovation* (HarperBusiness 2009). He blogs at designthinking.ideo.com