Stanford eCorner

Clean Design Protocol from the Bottom Up

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McDonough + Partners founder William McDonough recalls the history of how his design firm came to investigate and inventory the marketplace of tens of thousands of industrial compounds, chemicals, and building materials, and how he has sought to both simplify and detoxify the process of product and architectural design. The supply chain is kinked with so many layers of products that even well-meaning manufacturers might not know the character of the toxic and disease-inducing compounds they employ. This industrial naivite has led McDonough to archive thousands of these industrial building blocks and rate their numerous properties and uses - and he encourages designers and inventors to consider this research in the engineering process.

Transcript

I'll just give you a bit of my background to give you a sense of how I got involved in all this. I was asked in 1984 to design the national headquarters for the Environmental Defense Fund. The head of Environmental Defense is a lawyer, and he said, "We want to make sure all of our people in the office are safe for indoor air quality and things like that." We took this very seriously and started looking around for consultants who could help us and talk to our lawyers about what it meant to design in a world where we're full of lack of information. I guess two things happened. One is we went looking for information and we couldn't find any. The state of the art indoor air quality in 1984, just for your information, was a consulting company that was primarily funded by the R.J. Reynolds Tobacco Company and was apparently doing research to show why there was no danger from second-hand smoke in the workplace. That was the state-of-the-art at the time. So we went back to EDF and said, let's get on with this project because there's no information out there and we started calling manufacturers and saying, "What's in your products? What is the off-gas and things like that?" And the typical answer we got was it's proprietary, it's legal, please go away. And we've been at this now for 20-someodd years and we're still asking the same questions and we still get sometimes the same answer.

When we looked at these issues, they become more and more central to the public experience. So here in 2000, on the cover of Business Week, but look at the language that's being used here. "Is your office killing you?" "The danger", "sick", and things like that. We're trying not to cause a shrill response. We're trying to look at this very gimlet-eyed and focus on the redesign of things to be safe and healthy. That's the purpose of all of this. Because what we found is that most people don't know what they're making. Some of them will send you letters like this one we got where it says, "We assure you, we do not know all the components or formulations that comprise the systems we buy." This is true. The system of production in the world today is fraught with unknowing activity that there are people making things left and right where we don't know what's in them. We ask manufacturers everyday, "What's in your product," and their answers are either, "We don't want to deal with this," or, "It just comes from our supplier.

Why don't you talk to them?" And then we talk to their supplier and they get their resins from another company and they say, "Well, if it comes from them, it's a resin. This is what we use, and we don't know what's in it. We just know it works." So there's a whole protocol ready to be worked on where we can optimize design by design. And it's important because if you look at buildings in California, look at this, you can walk into a building in California and be greeted by the following message: "The state of California requires that we warn you that the property contains chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. These chemicals may be containing emissions and fumes from building materials, products and materials used to maintain the property," and so on and so on. Isn't that amazing? And we walk by these signs everyday. And so what we see is that the first information we get are that things are not necessarily good out there, and that we're warned, and that becomes the first act of the guardian; it is to warn. What we need is new design because the warnings are really quite serious. Look at this warning that appeared in the New York Times. This was on the cover of, I think, the business section of The New York Times, this picture of a bezel on Action Network of what's happening with electronics that are going to China.

This monitor apparently came from a hospital in Los Angeles, and so here we are taking care of people's health at one side of the ocean; on the other side of the ocean, this woman is about to expose herself to toxic materials in abundance. This is our present design. So as we look at the whole notion of materials, what we realize is that the first signals are going to come from restricted substances like Proposition 65 or the REACH legislation in Europe will be restricted substances but really, as a species, what we could be looking at is, let's do a full inventory of our chemicals and what we're making. And then let's do an optimization based on design. So we have developed a protocol that allows us first to do inventory. One of the first products we did was a textile in Switzerland where we looked at 8,000 chemicals in the fabric industry and using these intellectual filters I'm about to show you, eliminated 7,962. And we're left with 38 chemicals which we used to develop the fabric because that came out of our assessment. This is our criteria for our assessment: No more cancer, disruption of our endocrine systems, genetic mutations, reproductive toxicity or birth defects. Sensitizations and toxicities are additional criteria. Here they are in English: Cancer, hormonal mimicking, chromosome mutations and so on.

So these are the first criteria that we looked at. The next criteria are ecological health criteria, and so we want to look at environmental health of the product and its manufacturing. We want to see if it's toxic to vertebrates, to invertebrates and to plants and water. Does it bio-accumulate? Does it bio-degrade? Is it persistent? Does it have heavy metals and things like that? Here they are in English: poisonous to vertebrates and invertebrates like plants and so on. And then we want to know how things are made and where they come from and where they go. And so we've developed a supply chain tool that can look at materials and where they come from, how much energy is involved, how far they have to travel. Do they involve testing of various kinds? Do hey affect the climate and stuff like that? So we looked at materials within this framework starting with materials that are considered nutrients. We then look at products and how they are recycled, and then we design and work with systems that recover and recycle these nutrients. So we give certifications now on products based on these criteria as well as energy going toward renewables, water going to drinkable, and social responsibility being practiced by the enterprise. And we rate materials relative to each other and these absolute criteria based on green, little or no hazard, through the red which is high hazard.

And we've developed a database now with thousands of chemicals so we can look at this is, for example, formaldehyde and we can profile it based on these criteria so you will notice that it's carcinogenic. It develops as mutation. The possibilities: reproductive to toxin, acute toxicities, irritation of membranes and things like that. So these products can be assessed and then we can work with them in the formulation of both chemicals that are developed using these substances. We can also look at whole systems and how they take that chemical or that substance and use it within a whole system of whether it gets released or not. Because, you see, these materials don't know whether they're good or bad. You can't talk to cadmium and say, are you a good or bad? Cadmium is a heavy metal. It's highly problematic and exposed to people in the environment, it's a heavy metal. It's not a good thing. And so the idea of a NiCad battery is from a design perspective; not a great idea because a child could hit that battery and knock it open and release the cadmium.

It can go to a landfill. It ends up in your wastebasket. This is a bad use of cadmium. On the other hand, the use of cadmium for a solar collector that's owned by a company that is responsible for its products, and as products and service in close cycles, could use cadmium to make something that's infinitely reusable where the cadmium is sequestered from the biosphere. This would be an appropriate use of heavy metal. And so the cadmium good cadmium bad really depends on its use. So we have ways of weighing these factors into the assessments.