Rethinking Sustainable Design

As designers and design educators, we bear some level of responsibility for the flood of products produced by the global economy every year. A visible consequence of that responsibility is the strong and growing emphasis on “sustainability” whenever we meet as a community to discuss the future of design as a discipline. One curious aspect of the conversation about sustainability and sustainable design is a lack of precision regarding the words themselves. A certain level of ambiguity is to be expected, given the wide range of disciplines involved in the product design process and the relatively recent growth of interest in these concepts. However, we believe the need for more effective action, in the face of globalization pressures, requires that we begin to think more precisely about what “sustainability” actually means, in terms of the products we produce, and the practitioners we educate.

We begin by confronting the assumption that it is possible to create “sustainable products.” In fact, as ecologists have long noted, sustainability is not “… an end state that we can reach; rather, it is a characteristic of a dynamic, evolving system.” (Fiksel, 2003). Products can promote and encourage environmental responsibility by their users, but strictly speaking they cannot be “sustainable” in and of themselves. A consumer product can be designed to use environmentally sensitive materials, to consume minimal energy, and to allow for easy disassembly and reuse, but there is no guarantee that such a product will somehow find its way back to the manufacturer for reuse and/or remanufacturing, unless the system in which it “lives” is designed to capture it, remove it from the waste stream, and treat it in a way that promotes sustainability of the system. In short, products are not sustainable—systems are. While this might seem to be just quibbling over semantics, we believe it is crucial for designers to understand that merely designing “virtuous products” is not enough, if doing so relieves the designer of the need to think about the larger system in which the product is embedded.

Furthermore, without understanding the drivers that promote wasteful human consumption, improving the sustainable characteristics of a product or product system may not be sufficient to make significant ecological impact. It is simply not enough to focus on the symptoms of the ecological crisis; rather we must concentrate on the causes (Chapman, 2005). We see examples of this symptom-based approach everywhere. Perhaps the most popular one is to limit one’s thinking about sustainable solutions to the choice of materials. Purchasing a product because it is made out of a bio-plastic might liberate the consumer’s conscience, but if it leads to greater consumption, material and energy use, along with more trips to the landfill, the net result may in fact be negative.

We believe designers need to get beneath the periphery of the problem and focus on how to develop products and systems that support the lives of the users without encouraging the wasteful cycle of desire, frustration, and replacement that many current products generate. We need to enable consumers to transcend an unreachable level of satisfaction by engaging them with their possessions through a diversity of emotional and experiential levels. The products we design are artifacts of our culture no less than flint arrowheads are artifacts of now vanished cultures. We know that cultures, and their artifacts, evolve over time. Our task as designers is to try to steer that evolution in a direction that does no harm to generations yet to come. This inquiry has to include questioning not only the kinds of products we make but also the role of design in the economic and social aspects of sustainability.

The Short Life of Durable Products
We are living in an era in which consuming in excess has become an accepted practice among most people in the West. Products that once were considered luxuries are now perceived as necessities. Advances in technology generated unprecedented wealth; access to physical goods has dramatically increased as a result. Through the decades, goods and commodities have transformed into services and in our own time, services have transformed into experiences. Goods and services are no longer enough: consumers are not satisfied with the product alone. Instead, they demand a more sophisticated relationship with the product and its brand. They look for a level of satisfaction that goes far beyond how the product meets basic the functional needs (Pine & Gilmore, 1999). Excess consumption itself has become the driving force behind modern economies. Given the fact that the *useful life* of products (productive life before the product is discarded) is generally much shorter than the product’s *actual life* (total product lifespan), increasing perceived value and thus longevity can be powerful strategies in the quest towards sustainability.

**What makes a product valuable?**

The term “value” originally denoted the actual worth of something, in the economic sense of exchange value as defined by the 18th-century political economist Adam Smith. For the purpose of this paper, we define value as *the worth an individual has assigned to something, both in terms of cash payment and psychological attachment.*

The criteria most often used to assign value fall into two categories: *Intrinsic or objective* values, and *extrinsic or subjective* values. Objective values are measurable characteristics of products or services, such as size, availability, quantity, materials, etc. Subjective values are quite the opposite: they are defined as what a product or service means to an individual as a result of the benefits derived from using it and owning it (LaSalle & Britton, 2003). These two categories are closely related. Products, services, and consumer attitudes all evolve within a given market and culture; thus a product that was previously difficult to attain and meaningful to own can become less valuable if its availability increases and the cost of ownership is decreased. In fact, something once thought to be extraordinary can easily become ordinary over time, since the most common driver of these changes is attributed to technological advances. On the other hand, a product that is considered ordinary in one culture can become extraordinary in another where the objective and subjective values differ.

The fluidity of value generates marketing strategies that appeal to consumers at an emotional level. The act of staging an experience for the consumer has often been used to boost the sales and maintain the competitive level of what are actually mundane objects. Starbucks has been able to increase the value of a cup of coffee from a few cents to four or five dollars, by providing customers a “Starbucks coffee experience.” However, in the current economy, Starbucks has seen a dramatic drop in sales that is attributed to fewer customer visits. These customers now question the value of the experience relative to meeting more basic needs. Starbucks’ response is to adapt to this new challenge by continuing to invest in the experience, expanding from coffee products by introducing an entertainment business strategy. With this strategy, Starbucks is not only reaching the customer at an emotional level, it is also expanding the context of the brand.

The fact that value is context-driven opens opportunities to promote sustainable product use and development. In our view, how products are used and discarded is a direct result of how they are valued: product longevity is often determined by how much value is placed on a product, whether that product is a cup of coffee, a child’s tricycle, or an automobile.

**Is there a “green” value?**

The increasing complexity of the global business environment, coupled with rising energy and transport costs and more restrictive regulations, particularly in the EU, are driving a major focus toward greater sustainability and corporate social responsibility. Companies are also promoting a “green image” for competitive advantage. Nevertheless, for a growing number of companies green strategies are a serious and effective approach to sustainable and profitable global business processes (Shecterle, Boyd, & Senxian, 2008). Corporate social responsibilities and
Green initiatives have also been viewed as a required component of corporate brand image. Unfortunately, when mainstream companies with diversified portfolios, appear to be taking advantage of “green” value for positioning purposes exclusively, they may be lowering the value of the products or services they offer by reducing long-term customer trust.

Green values are also context driven. To many Europeans, for example, products that reflect low green values such as Hummers are offensive because they represent a “typically American” profligate use of resources. For people in developing countries, paying an additional premium for green products may be infeasible, while on the other hand sustainable practices such as extending the life of products, or utilizing local materials and resources, are natural consequences of their existing economic systems. Thus for those in developing countries green values have very different meanings.

What makes a product obsolete?

“Waste is symptomatic of failed relationships” (Chapman, 2005). When customers make a purchase they invest time, money, thought, and often, emotion. In return they expect the product to deliver the promised benefit at a minimum. Customers engage in a relationship with the product that is dependent upon how successfully the product delivers on the promise. According to LaSalle and Britton, companies interested in delivering valuable experiences to their customers need to increase the benefits or rewards and decrease the sacrifices. In the context of products, the value of the rewards should outweigh the sacrifices. For example, the Dyson vacuum cleaner delivers powerful visual cues to the user while cleaning surfaces. Seeing the dirt collected as it is removed from the carpet is a critical aspect of the cleaning experience and is valuable enough to customers that they are willing to pay a premium price for it. The fact that the attachments are cumbersome to handle and the machine is heavy does not detract from the initial benefit.

The experiential approach takes the relationship with the product beyond the initial purchase stage, but it does not contribute to the product’s longevity. In the case of the Dyson, the original promise at the purchase point is that the device will never lose suction, but what happens when it does? Is the immediate reward of seeing the dirt collected enough to overcome this sacrifice? What happens when the machine breaks down and the customer can’t find a repair shop? The customer-product relationship starts to deteriorate, and gradually the customer loses interest in the product. The value experience was designed to meet short-term needs and desires of customers, but it was not designed to sustain the customer-product relationship over the long term.

In the case of toys, this problem is even more critical due to the fact that the toy manufacturer promises the parent that it will deliver a reward to the child. Unfortunately, the parent cannot predict if the child will place any value on the toy. For the parent, the objective and subjective values of the toy may be in place, but for a small child, his relationship with the toy is based almost exclusively on the toy’s ability to sustain an increasing level of enquiry. When a toy is successful in sustaining this relationship it becomes valuable to both the child and the parent. Unfortunately, the toy industry is replete with products that are designed with a short-term relationship in mind; consequently it is responsible for a high volume of waste. These products are often quickly discarded, but the materials used in their construction can last for hundreds of years in landfills. Given the fact that children mature rapidly, very few toys are conceived with a long-term relationship with the user in mind. On the other hand, parents have few options; in their constant search for the one product that their child will cherish, they may be engendering an increasing cycle of desire and disappointment in their children at a very early age.

The volume of waste produced by the pattern of short-term desire and disappointment is a major problem that extends far beyond the toy industry. Technology is one of the main drivers of this vicious cycle. The constant need to keep up with the latest and greatest has shortened the useful life of functioning products. How many perfectly good computers, cell phones, MP3 players, and digital cameras are discarded every year simply because they are not the “latest?” Electronic products are similar to toys in that they too are designed with a short-term relationship in mind. Customers are not able to develop a lasting relationship with products that do not possess the
diversity and pluralism of character required to healthily sustain enquiry (Chapman, 2005). Unfortunately this pattern suits companies well. Extending the life of these products may be in conflict with corporate profit margins, so research and development efforts have focused primarily on how to continue doing the same thing in a slightly more responsible way, such as lowering energy consumption and developing new materials or processes. A challenge for designers is also to develop profitable ways of not only creating customer–product relationships but sustaining them as well.

**Strategies to Increase Product Longevity**

**Increasing the user experience by generating emotional attachment**

Many companies now recognize the need to stage “experiences” in order to add value to the product; in the toy industry we can find examples of several strategies. The focus of these strategies is on designing experiences in order to engender greater customer loyalty and increase the perception of value (Pine & Gilmore, 1999). An outstanding example of these strategies is the “adoption” concept created around Cabbage Patch Kids. When a child acquires a doll, the doll is not “purchased”; rather, the child “adopts” the doll, which comes with its own name, birth certificate and adoption papers. Parents can take their children to the “hospital,” where the birth and adoption process is staged to create an emotional attachment between the child and the doll. Another method that Mattel has implemented with this line of products is to develop an emotional attachment through a process that Pine and Gilmore call “collaborative customization.” The parent can order a doll with specific physical characteristics so that the doll resembles the child it is intended for. It is less likely that a parent will ever discard a toy, especially a doll that was fabricated exclusively for their child. Even though the motivation behind implementing these strategies has not been sustainability, there are opportunities to explore customization of products in order to extend their usable lives. In the case of the Cabbage Patch Kids, the longevity of the doll is based on merely subjective values. If the doll doesn’t provide the child with any additional “level of enquiry” the reward is sufficient for the parent or child to create a lasting emotional attachment.

Are there other ways in which customization can contribute to sustain enquiry? If a computer, for example, could learn how to adapt to its owner’s specific needs, habits, and preferences, and gradually evolve features that were specifically adapted to the owner’s patterns of use, the owner would then be more inclined to extend its useful life because it would have greater value than a new one. Most computer users do not need the latest and fastest models in order to accomplish their daily tasks—in fact, users often struggle to disable new and unwanted features in upgraded computer operating systems. Additionally, extending the life of a computer for even a few months can have a more positive impact on the environment than reducing its power consumption or implementing sustainable materials (the energy consumed during production is four times higher than the energy consumed during the computer’s the useful life (Kuehr & Williams, 2003).

Diversity and pluralism are also powerful concepts in the search for sustainable customer-product relationships. If we go back to the toy industry, we can find a few successful examples of sustained level of enquiry, such as the Lego building systems. This toy offers the child a great level of diversity: the products are designed specifically to grow in difficulty as the child moves through different maturity levels, by affording different levels of complexity in games and structures to build. The toys adapt well to single and multiple player activities, and most importantly, they allow for “open ended” play in which the child’s imagination is the only limit to how they are used. The long lasting quality of the individual bricks is also part of the valued experience. They were designed to last and maintain stability and integrity through time allowing users to build a “durable narrative experience” (Chapman, 2005) thus becoming a cherished possession that can be passed on through generations.

Objects that survive over time build up layers of narrative by reflecting traces of the user’s care and attention (Chapman, 2005). Well-designed products like the Lego system encourage the development of those narratives over time, but we can also find examples where this natural
characteristic of long-lived products has been developed as a strategy to create customer loyalty and sustain a “durable narrative.” Harley-Davidson™ motorcycles is an excellent example of this strategy. Harley has taken the mystique associated with older products and transferred it to their new products. By constantly reminding consumers of their storied past, they convince them that they can purchase authenticity right out of the showroom—in effect, buying someone else’s “narrative of care and attention.” Harley-Davidson motorcycles are cherished possessions that are carefully maintained, both their subjective and objective value increasing over time.

Designing adaptable products

Co-evolution of products, technology, and values. The lesson we take away from the long-term viability of the Lego model is this: products designed for maximum adaptability can be effective in increasing the value of the product, both objectively and subjectively. The question then becomes: can this strategy of designing long-lived products be applied to the design of product families in other market niches?

Just as designers and engineers for years have looked to nature for inspiration at the level of the individual artifact, we can also look to the natural world for inspiration in designing adaptive systems. Nature’s response to the need for designing adaptive systems is evolution, and often, co-evolution. Evolution at its most abstract level is just an algorithm—a template or procedure to be followed to produce a desired result. The evolutionary algorithm has three distinct phases, repeated endlessly: generate several diverse candidate solutions; allow natural selection to determine the fitness of each; allow the genetic information encoded in the successful variants to continue into the next generation. In fact, although we often think of evolution solely in terms of biology, the algorithm itself is one that we find in all aspects of human existence, including language, culture, and technology (Dennett, 1995).

When we apply evolutionary theory to design and technology, the question becomes, what actually evolves? Is it the artifact itself, or is it the technical knowledge that is embedded in it? If it is only the artifact that evolves, then how to explain the obvious fact that our artifacts change us, too—as users, as designers and as innocent bystanders? One very interesting concept that has arisen from this discussion is Fleck’s idea of the artifact–activity couple: “…the dynamic ensemble of the artifact with the immediate set of human activities that sustains its use and development.” The activities that Fleck sees as evolving along with the artifact itself include the design, manufacture, and operation of the artifact, but also the organizations and cultures in which it is embedded. The boundaries of the artifact-activity couple vary with the complexity of the artifact itself, of course: a hammer has a much more confined space than a Boeing 777 for example. (Fleck, 2003). This is a powerful idea, because it provides us with a logical framework for thinking about artifacts in context. Now it makes sense to think about sustainability, because the artifact is embedded in a cultural and technological system that is itself changing over time. The question then becomes one of ensuring that the impact of this set of activities in an evolving culture does not put future generations at risk. Another point worth emphasizing: Fleck’s concept encourages us to look at users and artifacts as being closely coupled, which leads us to consider not only how the artifact changes the user, but how the user changes the artifact, and in particular, how this process might vary among cultures. Researchers have found that across many industries and types of products, from bicycles to scientific instruments, the users of the products are quite often the primary sources of product innovation (von Hippel, 2005). This is an idea that might seem threatening to designers and engineers, but in fact it can be a powerful source of innovation, as well as a financial opportunity.

When we take a closer look at the artifact-activity adaptation that takes place in developing countries, we can clearly see the evolutionary process in action. One very interesting aspect of this process is that often times, these adaptive processes are naturally more sustainable, due to the fact that necessity is indeed the mother of innovation. In developing countries, very little is allowed to go to waste, because the definition of value is quite different than in more economically developed nations. Adaptations to products and services tend to occur at all levels: not only do
the physical characteristics of product change, but also use, application and most importantly, value.

**Product and service adaptation in developing countries.** The challenges of adapting and incorporating technology and products that were designed to respond to needs outside a given environment are sources for innovation in many developing countries. When products are conceived specifically for a given cultural context, the artifact–activity couple is likely to be quite different when the device or service is introduced into a new product environment, because while the artifact may remain the same, the activities coupled with it may change drastically. A successful user experience developed by designers who are designing for Kansas City is immediately challenged when that product is introduced on the market in Mumbai or Bogota, for example. Going back to our biological analogy, we see a parallel with the transformations that naturally occur when species face abrupt environmental changes. In other words, how do users adapt the products to their contexts, and how do the products change the users and the use context? How does the activity itself change? How far removed from the designer's intentions are the customer's perceived rewards? Are the sacrifices required too large for the users to change their behavior? Most importantly, how can these changes impact the development of new products in both environments?

We believe that in the answers to these questions lie key issues that can bring light to sustainable product development. While designing products that meet unforeseeable needs is impossible, there is much merit in learning from these processes of adaptation. Currently, meeting the needs of people in developing countries has been an ethnocentric process. Industry leaders, designers and companies have the tendency to believe that our way of life is the desired standard. Not only is this not true, it is also not possible; rather than concentrating on marketing the products of our own culture in other contexts, we need to understand, promote and leverage from the co-evolution of products and systems in different cultural environments.

As an example, Nokia's human behavioral researcher Jan Chipchase studies behavioral patterns of cell phone users all over the world. His job is to observe, to listen and to document current and potential customers, and in turn inform the company on how people live and what they are likely to need in a cell phone. These findings guide and support the development of new products, applications, and services in the mobile realm. By studying the diversity of users and cultures, the research and development team seeks to adopt a design perspective that effectively balances the differences and similarities (Chipchase, 2005).

According to data from Wireless Intelligence (2008), 8 percent of the world's population currently lives within range of a cellular network; roughly 68 percent of global mobile phone subscriptions are in developing countries. Nokia's research covers a wide range of regions, from mature mobile phone markets such as Sweden and the UK, to emerging markets such as China, India, and Brazil. Understanding the intersection of culture and technology adoption is at the center of Chipchase's study. Looking at mobile phone use in the developing world is a perfect example of how research in cultures situated at earlier stages in the evolving process of technology adoption and adaptation can be fruitful. It is here, where novel and unpredictable solutions have been uncovered by Chipchase’s team, that product designers can gain new insights into how products can be more effectively designed, used, reused, and remanufactured.

One interesting finding, from *The Next Four Billion*, published by the World Resources Institute (2007), is the fact that even very poor families invest a high percentage of their income in information/communication technology. They do not need to own a phone in order to benefit from it. Unlike landlines that require a permanent address, cell phones allow users the ability to be connected without having the financial resources required by a more permanent commitment. People purchase cell phones or airtime depending on their needs. This may seem trivial for those in industrialized cultures, but the idea that you can be reachable in remote environments has powerful consequences. “Having a call–back number is having a fixed identity point, which inside populations that are constantly on the move—displaced by war, floods, war of faltering
economies—can be immensely valuable as a means of keeping in touch with their home communities and as a business tool” (Chipchase, 2005). Clearly, the subjective value of a cell phone for this very large group of users has reached a point at which they are willing to pay for it even if it represents a high percentage of their total income.

Another interesting aspect of this process is the generation of alternative business models that not only support the use of cell phones, but also provide income opportunities for their users and owners. In Bangladesh women use microcredit to buy specially designed cell phone kits that include long-lasting batteries. They then become their village’s phone operator, charging a small fee for people to make and receive calls. In Uganda, Chipchase discovered an innovative use of a shared village phone called Sente. People in Uganda use the prepaid cards in order to transfer money between villages. This activity has evolved into a formalized mobile banking system in South Africa and in the Philippines, where customers can use their phones to store cash credit transferred from another phone, or purchased in the post office, phone kiosk, or other licensed operators. Using the cell phone, people can make purchases, payments and withdraw cash as needed without the use of a local bank.

In Colombia, another interesting phenomena that has evolved since the introduction of cell phones is the proliferation of street vendors of minutes (Figure 1). The price differential between introductory promotions, individual and commercial contracts is large enough that it is profitable to buy a commercial account, and then sell airtime by the minute on the street. For individual customers, it is often cheaper to purchase minutes from the street vendor, rather than use their own cell phones. This practice has become the livelihood of so many people that recently the government was forced to legalize and regulate it.

Conclusion

The examples above all are instances of the adaptive changes that occur when human intelligence spontaneously creates new uses for products and technology based on culturally specific needs. These grassroots innovation practices are all clear examples of cultural and technological evolution at work. The artifact–activity model that was initially used to create the cell phones for markets in North America, Japan, and the EU is quite different from the one that created the mobile banking system, Sente, in Africa. Sente is a user-created solution to a local problem that Nokia designers could not possibly have predicted, but in fact the artifact they designed was flexible enough to support this “nonintentional” use. While space does not permit us to go into more depth here, Chipchase’s research has also looked at how mobile phones are repaired and upgraded continuously in the developing world—again, an activity that was not intended by the design team, but one that local users were able to create, based on necessity, their own inventiveness, and the perceived value of the artifact itself.
We have discussed the evolving nature of products, values and experiences and how by taking a closer look at the relationships between products, users, activities and context, we can begin to understand new opportunities for sustainable development. We discussed strategies and raised questions regarding the importance of designing for a sustained customer–product relationship, but most importantly we believe that many of the practices that have evolved in developing countries can point product designers in the developed world toward more sustainable designs and design practices. Learning how local users of their products have adapted their designs to provide new services can be an eye-opening experience for designers, and lead them toward creating more “open,” i.e., more easily adaptable, products in the future. Designing for sustainability is much more than a question of material choice or energy savings. It is about creating products that can thrive in diverse situations, adapted by local users to local contexts, and thereby live much longer lives as a result.

References


World Resources Institute, The next four billion, available online at http://www.wri.org, p. 46.