How does "green" mean- the emerging semantics of product design

Tao Huang
thuang@colum.edu
Kevin Henry
khenry@colum.edu

IDSA, Columbia College Chicago, USA

Abstract

This paper presents the challenges of perceptions in sustainable design and outlines a product semantic strategy to improve our understanding of "sustainable design" and give products new capacity to communicate with more environmentally-conscious users around the world.

Keywords

Product design, product semantics, sustainable design, social responsibility, ecodesign

Introduction

Sustainable design has evolved both in terms of sophistication and complexity. Part of that shift involves the expansion of green products from small batch production hand-crafted objects using ready-made or recyclable materials into full blown mass-produced objects. Which prompts the question: what does "Green Design" really mean and how do consumers understand it? The flip side of this coin is "Green Washing" which poses challenges to the role of industrial design. In a world where novelty and marketing increasingly drive consumption products must be able to communicate their 'green-ness' directly to the consumer in an honest and palpable manner. How can designers manipulate form, color, material selection, energy consumption, and the perceived affordances of a product to convince all stakeholders of its 'green' value beyond mere marketing or superficial appearances? Answers to these questions have great implications for design, marketing, and mass-production. Clearly, as new concepts of sustainable design emerge in design practice and public discourse, there is a need to update the theory of product semantics to reflect such large and dynamic changes.

To answer these questions, this paper provides a brief overview of product semantics from the past three decades and suggests ways to transform this critical theory. Using case studies, the authors analyze the new possibilities and challenges for eco expression facing the industrial design profession as it grapples with environmentalism. New concepts such as biommicry, de-materialization, service design, customization and their manifestations in products and the context and sub-context they create are explored.

Overview of the Theory of Product Semantics

Product semantics like sustainable design are two relatively new theories that are slowly maturing and intertwining in interesting ways.   Product Semantics can be subsumed under the larger science of semiology which is concerned with signs and symbols and their many uses. Sustainable design is an offshoot of both environmental studies and economic theories. The term product semantics was first coined by Klaus Krippendorff and Reinhardt Butter in their 1984 essay Product Semantics: Exploring the Symbolic Qualities of Form which redefined the role of product design as "the conscious creation of forms to serve human needs". The new approach was concerned with "the symbolic qualities of man-made forms in the context of their use and the application of this knowledge to industrial design". The 'semantic' of a product moves beyond the traditional 'form follows function' equation to include social, technical, and cultural communication as well.   The contemporary designer acts more as a communicator working with visual gestalts, physical and cognitive affordances, materiality and manufacturing processes to develop products with a deeper connection to the life and needs of the end-user. The industrial designer and author Rune Monö defined gestalt as "an arrangement of parts which appears and functions as a whole that is more than the sum of the parts," (Mono, 1997). Donald Norman defines the term affordance, first coined by psychologist J. J. Gibson, as 'the actionable properties between the world and an actor (a person or animal)' (Norman, 1988). Norman went on to adapt Gibson's original term to 'perceived affordance,' to emphasize the possibility of action regardless of whether such an action was in fact possible thus expanding the potential for greater interaction. Product semantics subsumes all of these issues into a unified design approach that merges the physical, cognitive, and emotional into a singular whole.

Challenge of Perception

The formal or aesthetic appearance of a product remains the central connection to our visceral experience of it while its functionality is tacitly assumed until actually tested or used. Both aspects must seamlessly intertwine in order to be truly successful or as Don Norman puts it: 'attractive things work better' (Norman, 2005). Adding

sustainability then into this equation further complicates matters creating new challenges of perception for both end-user and designer. Consumers in industrialized nations have come not only to associate good design with beauty and functionality but also low cost And while consumer concern for environmental issues is rapidly increasing the industrial designer is challenged to break this model or at least insert real green-ness into the equation. The challenge of the new semantics of product design must clearly communicate 'green-ness' beyond mere marketing or advertising verbiage. Several major hurdles exist in moving beyond the cliches of green-ness to large scale production of sustainable products.

The first hurdle is changing the perception of "green products" as craft-based, one-of-a-kind or DIY (do-it-yourself) endeavors. Alternative lifestyle magazines like Readymade and websites like Instructables often portray sustainable design as self-produced projects using recycled materials or altering (hacking) existing products. While these strategies remain part of the equation they can also negatively impact perception. Hand-crafted products are by their very nature limited in terms of quantity and sophistication. Few consumers would be willing to pay for a hand-made MP3 player or bicycle or trust a handmade medical device. Compared to conventional design, "green design" can appear less sophisticated, less attractive, less functional, and, at times, plainly crude. Consumers understand that cost is a direct result of quantity; economies of scale bring lower prices. Hand craft seems to be authentic- even exotic- but also difficult to produce in larger numbers let alone capable of generating real revenue. The end result may even seem "ugly" in the modern design sense.

Another hurdle is breaking the perception that renewable materials (anything from fast-growing bamboo and biofuels to traditional materials like wood and leather) are the solution to solving the needs of a world population expected to approach 9 billion by 2050 (United Nations projection). For instance, the energy required to harvest, process, and transport bamboo from its native habitat is often overlooked because of its fast growth and biodegradability. Similar logic applies to bio-fuel production, which often causes negative chain reactions in agriculture. Because something is natural does not mean it is cost-effective on a large scale or even desirable as it still uses precious resources like water, electricity, and fossil fuels to process and transport. Journalist Matt Powers claims that pound for pound, making a Prius contributes more carbon to the atmosphere than making a Hummer, largely due to the environmental cost of the 30 pounds of nickel in the hybrid's battery. Viewed in isolation, this comparison seems to suggest that a Hummer is more environmentally friendly than a Prius. Using systems thinking, one can easily point out that the hybrid quickly erases that carbon deficit on the

road, thanks to its vastly superior fuel economy. However, Powers continues to say that because a used car already paid off the carbon debt of its manufacturing process, a new Prius can never catch up with a highly efficient used car . These examples demonstrate the complexity of sustainable design and raise public skepticism towards these products. John Thackara writing in his book In the Bubble: Designing in a Complex World states that a laptop, for example, requires 4000 times its weight to produce while also increasing our reliance on paper. The computer, on the other hand, has increased productivity beyond question and will continue to play a pivotal role in everything from smart energy grids to smart cars and products . The complexity of such issues should be obvious while the direction forward is less so especially as some businesses rush to jump on the "green wagon", sending false signals and severely diluting the reliability of legitimate efforts to create eco-friendly products.

Eco-affordance: A New Product Semantics Strategy

Returning once again to J.J. Gibson's original concept of affordance which he defined as possibilities 'latent in the environment' for action, we must now amplify and expand the use and understanding of the word 'environment'. Rather than a reactive response, eco-affordance proposes a pro-active one by extending the environment of the product far beyond the physical engagement with the product to include materials and resources required for the production and the use of the product. Designers, in other words, must break out of the traditional mode of aesthetics and function to radically re-think what a product is if we are to fully engage the public in this issue and create real change. There are numerous strategies to employ that can change consumer perception and a product's true identity for lasting systemic change. Saving energy and resources are two of the main sustainable design principles, therefore, a product or service designed by sustainable design principles must think in terms of subtraction instead of addition of forms.

Dematerialization is one such example of a subtractive strategy, yet the consumer is often times unaware of its upsides as they purchase these newly configured products. One quick example is the creation of the MP3 format and the dematerialization of the CD-ROM. Are consumers in fact aware of the energy savings with this new digital format? Gone from the production of an MP3 file is the extraction of materials needed to create a CD-ROM and its packaging, the energy required to transport the product to a retail outlet, and the inevitable disposal of the disc at the end of its life. Again as Thackara points out, CD-ROMs are often used once and then disposed of. More recently Amazon's development of the Kindle as an alternative to traditional

printed books is an example of dematerialization on multiple levels.   As Nicholas Carlson wrote in Silicon Alley Insider: "it costs the Times about twice as much money to print and deliver the newspaper over a year as it would cost to send each of its subscribers a brand new Amazon Kindle instead" (2009). While this makes economical sense to the New York Times, it makes even greater environmental sense to its subscribers who remain largely unaware of the massive resources required just to print a disposable newspaper. University of Colorado reports that 75,000 trees are felled in the production of one edition of the Sunday New York Times - three such editions equals all the trees in Central Park. What makes these e-readers especially significant is the fact that e-ink requires very little energy to align the small spheres that make up the printed image. Each page turn requires a microburst of energy after which no additional power to hold the image is required until the next page is loaded. E-readers are energy efficient mobile devices (carrying 1500 books in one small and light device) yet the object's form alone cannot say: ' I am green'. Such a challenge will only be addressed through greater information on the internet, through advertising, and consumer advocacy.

Immateriality and the rise of services

Another example of immateriality is the development of service design. Italian designer and educator Ezio Manzini points out in many of his publications that service design is a hybrid of materials and immaterials that contributes to a more sustainable community because it reduces the individual consumption of resources. For example, instead of focusing on designing washer and dryers for every household, industrial designers could design laundry mat service to maximize the use of resources. While the term "service design" is not new, it has not appeared on the curriculum of design schools until recently. Though some researchers might not consider service design as a branch of industrial design, industrial designers and researchers have been involved in designing services for public or commercial use for decades as services are combinations of products, resources, organization, local and global economy, and human relations. Service design is multidisciplinary in nature and it involves large number of stakeholders, especially users, as they interact with the service while providing feedback constantly. To improve users' understanding of any service, services must be designed as a gestalt, meaning the visual identity system (graphic communication), the human-machine interfaces, and the physical and virtual forms of the service has to form an integrated system. Such an undertaking requires a shift in design education to think systematically about a service that exists over time and adapts through user input.

One last example is the I-Go or Zipcar phenomenon. The business model here is to reduce the number of cars (or car ownership) while providing 'car service' to the consumer. I-Go and Zipcar both take the complexity and hassle out of car rental creating instead the 'micro loan' model whereby member takes advantage of mobility for as little as an hour instead of renting a car for one or more days. Gone is the need to interact with a customer services person, pay additional insurance or even fill the tank up with gasoline. This dematerialization process provides all the benefits of a car while eliminating the downside costs of cars sitting and underused. Such a business model would hardly be possible without the existing wireless cell phone infrastructure which is one of the key issues with dematerialization. As new infrastructures develop, there emerge new ways of leveraging them to provide services in place of actual owned products. Such a model moves consumers towards greater social awareness and shared responsibility as we minimize the physical footprints of our lives. By literally minimizing forms, the "green qualities" of products and services will only become more visible. The other key ingredient is green marketing with an emphasis on real environmental benefits as opposed to imaginary or 'spun' benefits.

Products that actually 'talk' green

With respect to actual physical artifacts, eco-friendly products must not only appear highly functional in terms of craftsmanship but must last longer and be more serviceable. Service in this case refers specifically to the 'fixability' of a products so that it can service more than one generation of users. A functionally inferior or poorly made product, no matter how "green" it might be, is a waste of time, materials, and the energy used to produce it. This goes directly against the grain of our existing paradigm of 'product churn'. When products are so cheap the thought of repairing them is either not considered or worse yet, costs more than purchasing a new product. Half the world maintains service centers for everything from cell phones to small appliances providing not only jobs in this critical sector but relationships. Bringing a product to be serviced to a local shop expands the ecology of our artifacts and social relationships. One comes to know and rely on the local repair shop much as they do their local car mechanic or even doctor. The stakeholders are greatly increased along with the social capital.

Another effective way to combat "green wash" is for the designers to maintain the honest representation of materials. A successful example is the California based company Method. Their designers have observed the recycling process of plastic bottles that are used widely in the cleaning product business and worked with scientists to create new materials for better package recycling. Built on the sustainable design principles, their bottles use only

transparent or milk-white plastics to allow the colors of the liquids to communicate with the users directly. They also minimize the labels so that their containers will blend in with any kitchen or bathroom and therefore not easily be discarded. They reduced and consolidated the layers of the plastic materials used for the packaging for their disinfect wipes so the packaging can be recycled like other plastic containers. Combined with the streamlined and cosmetic-like design of their containers, Method has built a brand of cleaning products that is both eco-friendly and high-end.

Future Trends: Emerging Concepts and Semantics

A concept that has attracted much interest in the design profession is "biomimicry". Over the past two centuries, we have witnessed many design movements that centered on natural forms. Biomimicry on the other hand is much more sophisticated and demanding than the mere imitation of forms in nature. It demands designers to draw inspirations from the anatomy, physiology, and behaviors of living systems that have developed for millions of years. Sometimes these biological traits might be difficult to convey in physical forms because they exist at the microscopic level. For instance, designers will need to find ingenious ways to communicate to the users a biomimetic surface structure of a new adhesive material that was inspired by the soles of reptilian feet that naturally stick to glass and other non-porous materials like the Gecko. Biologist Janine Benyus uses the example of calcification noting how nature (shell fish for example) can turn it on and off as necessary and how this might apply to calcification in pipes . Or how the power of natural shapes (for example: the nautilus' logarithmic spiral) can influence the design of turbine and fan blades to improve efficiency by more than 50%. Nature works from a 'bottom-up' method so as not to produce waste unlike the human process which is generally 'top-down' beginning with material extraction and continuing through to manufacturing and distribution. And while it is impossible to remove or transform all of our processes it is certainly possible to make them more efficient, repairable, and customizable so that individuals have a great stake in holding on to products they were partially responsible for.

Customization as an extended stake

The last way in which products and product designers can 'green' products is by allowing for greater customization and modification. This connects directly to the power of craft and its close association to the 'gift' as opposed to the anonymous commodity. Gift communities have proliferated on the web around 'open source' software (Open Office), and knowledge platforms like wikipedia for the simple reason that they represent a 'bottom-up' activity. Such endeavors harness the power and good will of social sharing of knowledge and skill to create a new 'commons' owned by no one but shared by all. While it is

hard to replicate such a process with products, it is possible to co-create products or allow for modifications. In many ways this overlaps greatly with repairability but suggests greater involvement at the front end of the process as opposed to the back-end. Lego Mindstorms serves as a great platform (toolkit) for creating unique products from a set of components. Similar approaches could include lower level products like furniture and housewares which is an enormous market. Designing around total modularity and providing the incentive for the end-user to apply their own ingenuity will increase their stake and sense of ownership. With the emergence of rapid prototyping, mass customization could become more feasible thus allowing greater sharing of resources and design solutions that might be 'commonly' created rather than owned by a single individual or company. Again such a change would require the development of a supporting infrastructure within cities to create easy-to-use open source CAD/CAM software that could link directly to shared rapid prototyping facilities for small batch production located in a city. Such a model would re-focus and return some production back to cities, provide jobs, and minimize the insanely wasteful resources required to ship products from sites of cheap labor thousands of miles away.

Conclusion

The emerging semantics of sustainable design suggests that designers must become "ecologically intelligent", requiring them to obtain substantial knowledge of sustainable design and apply the principles of "good design" with "eco-friendly design" in their work. This will included expanding the 'ecology' of the product to include services, repair options and facilities, and micro manufacturing. Good design will stand the test of time and will hopefully be kept for much longer, therefore reducing the constant need for new products and reducing the materials and energy required to produce them. This paper intends to start a conversation to help designers explore these possibilities to join sustainable design and product semantics in creating a new understanding of the environmental and ecological challenges facing our profession.

Bibliography

Krippendorff, K. (2006). The semantic turn : a new foundation for design. Boca Raton: CRC/Taylor & Francis.

Mono, R. (1997). Design for product understanding : the aesthetics of design from a semiotic approach. Stockholm Liber AB.

Powers, M. (2008, May 19). Get Ready to Rethink What It Means to Be Green. Wired, 16.06.