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# GIVING THE PRODUCT A VOICE: USERS AND INFORMATION IN SUSTAINABLE SYSTEMS

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**ABSTRACT**
"Recycle, Reuse and Reduce" are popular concepts among designers and seem to be useful strategies to follow in our quest for more sustainable designs. Unfortunately, creating a "green" product does not ensure that the product will behave in a sustainable way once it is placed in the hands of the users. Sustainability is a property of a larger system within which products reside; accordingly, the focus of this paper is on the role designers can play in the creation of product systems and the subsequent relationship to resource efficiency and sustainability. Also considered, is the roll of information in "communicating" product system goals, incentives, and perspectives to the user. By designing information sensitive products and systems, the designer can empower users to make the responsible decisions required to achieve sustainability.

*Keywords: User Information, System Design, Information design*

## 1 SEEING THE BIG PICTURE

The age of the 'green product' is upon us. Concepts such as 'reduce, reuse, recycle', and even 'sustainable design', have all made the transition from academic conferences to mainstream commerce. Perhaps as a side effect of growing concern about global climate change, environmental responsibility has become a focus of both the design and business communities. Whether this concern is genuine or not, only time will tell; nevertheless, nearly every global corporation realizes the importance of prominently displaying their 'green consciousness'. Whether the motivation is to actually make a difference or to merely cultivate a positive public image, green and sustainable products are hitting store shelves faster than most consumers can keep up.

However, a glance at some of the allegedly 'green' products on the market today is enough to convince the serious professional that the vision of both designers and manufacturers is far too myopic where sustainability is concerned. The problem can be simply stated: as designers, we have focused on the details, but neglected the whole. We have latched on to slogans such as 'reduce, reuse and recycle', as if they were the first and last word on sustainability. Perhaps these ideas have been championed because, while not always easy to accomplish, they are at least easy to strive for. By choosing to convey these ideas to the public, we do create an awareness of the need to act, but we may also be creating the illusion that we are solving the problem.

This intense focus on the product egregiously oversimplifies the problems we face in achieving truly sustainable economies. By rendering invisible a number of complex systems that must all work together in order to create sustainability, we unintentionally make the problem appear to be much simpler than it actually is. It is crucial to keep in

mind that *sustainability* is a characteristic of a *complex system*, not an isolated product. We assert that there is no such thing as a sustainable product, only sustainable systems of which products are components. Individual products can be designed to promote or impede the sustainability of the system, but product design in and of itself cannot guarantee sustainability. To truly promote sustainability, the design community must begin to think at the level of the larger system, while still maintaining our focus on individual products.

As a case in point, consider one of the best current examples of a sustainable product, the Aeron Chair from Herman Miller. This chair is comprised of an impressive 62% recycled materials, including recycled soda bottles! At the end of its useful life, it is designed to be fully disassembled, and 92% of its materials are recyclable [1]. Yet despite the undisputed virtues of the chair itself, what has been done to ensure that the chair ends up anywhere other than a landfill? What prevents the user from simply sending the chair, which has likely lived out its life in an office, to the loading dock with the rest of the refuse? How is the crucial step of preventing the chair from entering the waste stream to be accomplished? What information is embedded in the chair to help the user take the steps necessary so that 92% of the materials actually *are* recycled? These are the sort of system–level questions that must be asked every time a product is designed; the lack of answers shows exactly why the Aeron Chair is a good example of successfully focusing on the details, while overlooking the larger systems issues.

## 2 DESIGN FOR ISOLATION AND INTERCONNECTEDNESS

*"No man is an island, entire of itself; every man is a piece of the continent, a part of the main."* – John Donne, *Meditation XVII*

Although written four hundred years ago, the famous quote from John Donne is an apt reminder of a fact confronting contemporary designers: the overwhelming majority of products produced every day are 'islands'. They possess more functionality than consumers of even a decade or two ago could imagine, they look incredibly stylish, and quite often they perform their functions flawlessly – but little or no thought is given to the question of where and how they fit into the larger scheme. Product designers are rarely asked to consider how their designs are part of a larger 'continent': they are only one component part of several interlocking systems that directly affect how the product is used or misused, treasured for decades or quickly discarded, disposed of in a way that ensures long–term health of the society or tossed into a landfill.

If we are truly serious about attaining our avowed goal of designing for a sustainable economy, it is essential that product design teams learn to recognize and take advantage of the complex interactions that occur within these systems. Designers also need to understand the role of the different users within those systems in order to provide the information needed to "connect" the two. All designed artifacts exist within, and are products of, extremely complex webs of human structures: economic, technological, social, and legal. To date, our focus has been primarily on materials and energy. While these issues are without question necessary, they are not sufficient to ensure sustainability. The role of the different users and the effects of their actions on the product's life is a critical aspect of the sustainable behavior of a product in the market. While little attention has been paid to this area of research, examples of successful user participation within product systems do exist. Perhaps motivated by the product's value and not by social responsibility, we can find several examples where the user's active participation in the system has resulted in sustainable behavior.

The value of the product is directly responsible for US heavy equipment manufacturer Caterpillar's remanufacturing section which creates over one billion USD profit a year salvaging, rebuilding and reselling "up to 85% of the 'value add' from the original manufacturing" [2]. Another template for capturing products at the end of their useful life is the system used by Xerox for many years. Rather than sell their copiers and printers, Xerox leases their machines in order to retain ownership; this also ensures that they maintain control of waste streams over the entire life of the product. In both cases above, the financial value of the product is quite large, but there are still instances further down the value scale. In the United States, automotive service centers and supply stores have established channels for battery recycling, so that when a new battery is purchased, the old one can be returned for recycling; when a used automotive battery is recycled, nearly 100-percent of the components are re-used. Finally, at the very low end is the example of the Kodak One Time Use Cameras; these cameras are ingeniously designed so that the consumer is used as an agent to return the camera to the manufacturer and everything other than the battery is recycled and reused to produce a brand new camera [3].

In all of the cases above, the user is considered as an active part of the system and is responsible, whether knowingly or not, for returning the product after the desired service has been completed. It is important to note that the user's role in the system was considered during the design process.

## 3 CONNECTING THE USERS TO THE SYSTEM

While the Kodak One Time Use camera is a wonderful example of a sustainable system, it cannot be considered the norm; with much thought and collaboration, we have yet to come up with another product that so eloquently forces the user's hand, and returns itself for reclamation without the user even realizing it. Because of the rarity of this system, it is incredibly important that designers think not only about the system, but also consider ways in which to include the "user" as part of the system. What it comes down to, is that in most cases a product is not going to mitigate its wastes all by itself, so designers must provide the appropriate information, at the appropriate time to the appropriate users, in order to ensure that a product and its surrounding systems can be dealt with in a sustainable manner. When a product interacts with one of its users, information is the crucial component that allows the user to make the connection between the product and the complex system within which it resides. Information connects the product to the whole, the user to the system, and the "island" to the "main"; it can be used to immerse or inform the user, and is critical to creating and maintaining a sustainable product system.

While most designers seem to focus solely on improving a product's energy efficiency, life span, packaging, and recyclability, "providing easy access to information about product design, materials, and recycling options" is every bit as important [4]. In order to provide the users of our products with the information required to act in a sustainable manner, it is very important that we, as designers, research and make the connections between our designs and the systems in which they exist, but it is more important still that we reveal these connections to all of the product users. By users we mean every active agent who comes in contact with the product over the course of the product's lifecycle. From the individuals the product was designed for (primary users) to those involved in the supply chain, manufacturing, distribution, service and maintenance, re-use and finally disposal (secondary users), each is an equally important part of the lifecycle. Without any one of these users, our products could never function correctly or

have any hope of being sustainable. Because of this we must use a thorough systems understanding, in conjunction with robust information design, in order to embed this system information within our products.

Once we have embedded this systems information within our products, whether done visually or through the usage of technology, we must consider how the users will extract the relevant information at the proper time. Again, this is accomplished through considered and thorough information design. Without saying a word, product systems must be able to "speak" to each and every user. At times, this "conversation" can be the same with each user, but in other instances a product must be able to "say" different things to different users in different situations ─ for example, a primary user probably does not need to know what percentage of recycled plastic regrind is in their product, but this sort of information is crucial to a recycler or a remanufacturing operation. Additionally, in order to be able to make educated choices, primary users require information about the manufacturer's sustainable practices (e.g., in–house recycling programs), components, materials, uses, energy consumption, and the impact of their individual actions on the overall system. They specifically need up–to–date information about how to return or dispose of the device at the conclusion of its useful life.

The group of people we refer to here as 'secondary users' may likely have as much need for information about the product as the primary user does. Manufacturing personnel will need to know how to correctly assemble and disassemble the device, and they will also need accurate information about the materials involved; this includes not only the types of materials, but also where the materials will come from (recycled, reused, etc.) and how they are to be processed. Service personnel will also need to know specific information about disassembly and materials, but in addition they require information about how and where to receive replacement parts and return materials for recycling; whether the item is a computer motherboard or an automotive fuel pump, information is essential. Recyclers will need to know *exactly* what material they're dealing with: not just whether the plastic is polyethylene or polystyrene, for example, but who the manufacturer was, what additives are in the blend, and what concentrations those additives are present in.

As designers, we do massive amounts of research in order to create wonderfully usable products, but we seem to ignore the users', both primary and secondary, need for information. By doing this, we isolate both product and user from the processes and systems that contribute to a sustainable product lifecycle. While in no way discounting the importance of disseminating information to producers, distributors, and service personnel, we must be especially deliberate when designing and embedding information for the primary users and those in charge of end of life management (either re-use or recycle). Because, as the last groups of people to touch our product before its end of life, these users have the final say as to where our products will ultimately end up; the actions of these users determine if our product is reused or relegated to a landfill. Accordingly, our products must "speak" the information and incentives that will promote users to make sustainable decisions regarding our products.

## 4 EXAMPLE: THE PERSONAL COMPUTER

As of early 2007, there were roughly 6.5 billion people living on earth – there were also one billion computers in use [4]. It would be an understatement to say that computer usage has exploded since their popularization just two decades ago; the computer has become an essential part of the efficient functioning of business systems world wide, and has helped to reshape the economies of most countries in which computers are

prevalent [5]. The short lifespan of PCs imposed by the rapid progression of technology only compounds the problem, and shows the one billion plus PCs in use to be only the tip of the iceberg, sitting above a mountain of e-waste. Combine the sheer number of PCs with the fact that there are very serious environmental implications "due to the impacts of production, use, and disposal of the equipment," and the world has a very serious environmental problem on its hands [5].

Because of the inherent complexity of the PC, recycling is difficult and production is an energy and material intensive process; 1.3 kg of fossil fuels and chemicals are used to produce a two gram memory chip, and 262 kg of fossil fuels and chemicals are used to make one desktop computer [5]. While many corporations and governments are attempting to address the problems listed above, there are definitely opportunities for the design community to get involved and make a difference; in order to do so however, we must consider information, systems, and how the user behaviour will integrate into our product systems. In order to move towards sustainability, we must realize that beginning with the purchase of a new computer, the user needs the appropriate information, whether provided through labels, media, or information design, to make informed decisions based upon production methods, environmental analysis, government policy and end of life options.

Because its components are highly integrated and contain huge varieties of materials and chemicals the PC is very difficult, and in some cases, nearly impossible to recycle. A clear instance of when recyclable/sustainable materials alone do not make for a sustainable product, energy savings possible from recycling pale in comparison to those possible by extending the life of the PC through upgrading or reuse [5]; savings are a result of eliminating the energy and material needs of new PC manufacturing. Re-selling and reuse of PCs is an issue that is largely dependent upon the system in which a PC exists. It is also largely dependent upon the information that is provided to the user; the user must know what impact his decision to pass down, donate or re-sell the PC will have on the environment, in addition to knowing the proper channel for each of these actions. Another way to extend the life of a PC, thereby reducing the need for additional production, is through upgrading. Rather than the wholesale replacement of a PC, upgrading allows the user to adapt their PC to increasing technological demands at a pace appropriate for their specific usage pattern. Currently, due to its modular nature, the PC is one of the most upgradeable and adaptable products on the market, but because of poor transparency and information design, users rarely take advantage of these possibilities. PCs are frequently relegated to landfills as e-waste while new PCs are manufactured, further sapping energy and material resources. If the system, could "tell" the user when an individual component was malfunctioning, or needed upgrading, and then facilitate its replacement in an understandable and user-friendly way, it would allow for the continual upgrade of PCs; in turn greatly reducing the number of completely new PCs that need to be manufactured.

While the production of new PCs is the largest component of energy and material consumption, the electricity consumed to power PCs is still quite relevant [5]. In order to combat the energy consumption and costs associated with PC usage, users need more information than they are currently being given. Computers and monitors labeled with the Energy Star logo convey to users that the product is energy-efficient, but in order to actually realize any meaningful energy savings, the Energy Star functions like sleep and hibernate must be enabled. Placing the PC in standby or hibernate modes can achieve considerable energy savings, but it is estimated that only 25 percent of PCs and monitors correctly take advantage of these energy saving features; this is mainly

because of "misconceptions and a lack of awareness on the side of the user" [5]. Because of a lack of information and transparency, it is also difficult to tell when power management features are operating, or if they are operating at all [5]. Again this makes it clear that there has been a failure in the design of these PCs in terms of the appropriate information being embedded within the product; users should be able to immediately understand not only how their PC is functioning, but what the impact of their usage will be. The impact of revealing the proper information to the users in the context of the personal computer cannot be underestimated; not only could better information help the user to enable power management features, but it could also alert the user to their overall consumption and raise awareness for sustainability in all facets of the users' life.

## 5 CONCLUSIONS

Over the course of this paper, we have presented many of our ideas regarding what is required for sustainable design; this big picture approach stresses that in order to move towards sustainability we must not only get the details of our products right, but we must also master the generalities, the broad strokes of a systems perspective. Required in all of this is that designers put an emphasis on understanding, and designing for, the systems in which our products will live. However, we must not stop there; to reach our sustainable goal, designers must then use information, and information design, to allow their products to "speak" to users in order to ensure that the user is enabled, and encouraged, to make the responsible decisions that will ultimately sustain our designs.

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