

# **‘The Butterfly Effect’**

## **Creative Sustainable Design Solutions through Systems Thinking.**

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### ***ABSTRACT***

*This paper discusses how product designers should begin to think beyond product based solutions in order to fulfil user needs and instead focus on holistic solutions that are ‘Result-Oriented’. The paper discusses whether product designers must in fact become ‘systems designers’ in order to bring about the paradigm leaps required by sustainability issues. A first principles approach is explored by applying systems thinking to the inception stages of a design project. A variety of designers are asked to rethink the process and generate innovative ideas, based on a systems brief, where the individually owned product would be replaced with a shared system for ‘Clothing Care’.*

The problems of the world cannot possibly be solved by sceptics or cynics whose horizons are limited by the obvious realities. We need people who can dream of things that never were’

-John F. Kennedy

### **INTRODUCTION**

Sustainable Product Design is a relatively new idea within the field of Industrial Design<sup>1</sup> and how it fits into designer's practice is still very much being decided upon. The path is not yet clear and Designers often feel lost in the face of what would appear to be a huge and ambiguous area. This paper studies existing design practices and approaches to Sustainable Design; it presents systems theory as a vehicle by which to explore possible solutions to the issues of consumption and environmental degradation. It aims to identify the challenges posed to designers in integrating these sustainable practices into their everyday work by exploring the designer's capacity for innovation.

### **SUSTAINABLE DESIGN**

Sustainable design aims to go beyond meagre eco-design solutions. The justification being that there is little benefit in curing the symptoms of a problem when the system within which it operates is inherently flawed.

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<sup>1</sup> For the purposes of this thesis the terms Industrial Design and Product Design are interchangeable and relate to the design of products for mass or batch production.

Sustainable design must be preventative and not simply curative [1]. Research has shown that various innovative approaches to sustainable design are being explored amongst them are 'Cradle to Cradle' theory; Biomimicry and Biothinking; Emotionally Enriched Products and Product Service Systems.

The very idea of Sustainability however, holds '*fundamental and uncomfortable challenges to the design status quo*' [2] as Industrial design mainly concerns itself with the design of products for mass production and solving problems with consumption oriented solutions. Design must become concerned with creating a balance between what are the disparate concerns of environment, economy and society. And so follows the question of how to design in a world of finite resources whilst maintaining the delicate balance?

The solutions to over-consumption are apparently simple; reduce overall consumption (stop using so much!), reuse, repair the products we already have; recycle them when they have reached the end of their useful life or rethink the way we do things. If the answers are so obvious, why then have they not been implemented years ago?

Designers have the skills and perhaps unknowingly the power to change people's behaviour, just as they helped encourage mass consumption and obsolescent lifestyles so too can they force responsible and conscientious 'product' use. Designers must not be shown how to do things better instead they must begin to learn how to do things differently.

Within the field of design, there is enormous potential to integrate sustainability issues, as design is a process used to develop innovative yet pragmatic solutions. It seeks to bring out new ideas of things that do not already exist as well as the putting together of standard known routines in a novel way. Richard Seymour believes that designers should lead the way with new visions of the future that are an improvement on the present [3]

It is recognised that a paradigm shift in how design is approached may be required, however if Sustainability concepts are to be correctly integrated into the entire design process. Richard Rogers believes that design must become about '*mobilising creative thinking and technology to secure humanity's future*' [4] With 80% of a products cost as well as environmental and social impacts being determined during the design, development and product planning phase [5] it is clear that emphasis in a 'products' life cycle must be placed at the stages of inception. Designers should be encouraged to generate and develop innovative concepts at the earliest stage. First Principles approach to problem solving must be adopted if the creative leaps are to be attained.

## CHANGE

In the 1960's Harry Bertoina said '*The urge for good design is like the urge to go on living, the assumption is that somewhere hidden is a better way of doing things*'. This better ways of doing things has been neglected and buried under mounds of societal and marketing requirements, manufacturing limitations as well as monetary and time constraints. The efforts today are concentrated on simply finding more and different ways of doing the same thing.

Products were initially designed to embody a function [6] but the product quickly became the focus, with the result being an emphasis on the product and not necessarily the function it was designed to fulfil. It is clear that current product trends and design practices are unsustainable. Design as we know it has arguably reached its limit of progress, the game of design has become a meaningless process of redesigning existing solutions, tweaking tiny problems and creating more iterations of the same thing. Now designers as well as industry and consumers see the product as the 'endgame' and solutions are no longer 'result oriented' but 'product oriented' instead. The time has come for designers to shift their emphasis from the design of a product to the provision of a task related system (e.g. from car sales to mobility services) [7].

Stuart Walker implores designers to begin to look at products in a different way and to desist from creating mere replacements for products and instead conceive of novel solutions [8]. Likewise Victor Papanek circa 1970 called for considered designs that respond to consumer needs '*Design must become an innovative and highly creative, cross-disciplinary tool responsive to the true needs of men...and we must stop defiling the earth with poorly designed objects and structures*' [9].

We can no longer say this will be a problem of the future, the future has become the present; designers and industry will soon have no choice but to reassess the systems we live in, replacing and modifying them as necessary. This change to Systems thinking however will require a paradigm shift in design practices.

The first step is changing the way in which designers and consumers perceive 'the product'. Designers must reassess the task users need to achieve with a 'product' and look carefully at the system these 'products' inhabit. Only then can change be brought about and goals reached in as sustainable a way as possible (which may or may not involve tangible products within the system).

The main focus of the designer would be to design the *'equipment to fulfil a service'* [10] and no longer just a product, necessitating a holistic look at the system this 'equipment' would be operating in. A change in the rules of the design game would provide a fresh and novel approach. Designers could begin each project with a clean slate to allow for an untainted free flow of original thought; all too often they approach a project with preconceived ideas as to user needs and possible solutions.

## CONSIDERING THE SYSTEM

Clayton and Radcliffe in 'Sustainability – A Systems Approach' observe that in order to gain a deep understanding of sustainability, information from a wide range of disciplines is required, as sustainability itself involves an inter-sectoral approach (economic, environmental and social) [11]. A systems response is ideally suited to solving this problem as it examines the interplay between different elements that may initially appear unconnected. *'A systems approach... provides a multi-dimensional framework in which information from different disciplines and domains can be integrated without being forced into a one-dimensional mapping'* (Ibid). Big problems like those we are faced with require big solutions, the viability of adopting a Systems response to the Industrial Design process is explored further through the paper as well clearly identifying the role of the Designer within this paradigm shift.

Systems theory requires a focus on the arrangement of elements that creates the whole and on the interplay between them; systems only function correctly when all elements are in place. The whole must be looked at, as well as the parts and the connections between the parts and the influence they exact upon each other in order to understand it fully (as well as the environment in which the system is placed and any external factors or mitigating forces) [12]. If changes occur with one element, changes will be induced along the entire system (like the Butterfly Effect and 'Chaos Theory'<sup>2</sup> [13]) and reflected in each element.

Traditionally Systems Theory is used in the fields of mathematics, cybernetics, science and philosophy (to name a few) to determine probable outcomes of scenarios. Its applications however are limitless, and after researching the fundamentals behind the philosophy, its benefits to Industrial Design practices became apparent. Primarily because it encourages a change from designing single products and focusing on individual elements, to addressing the problem as a 'whole', the scope for radical improvement increases when the bigger picture (or entire system) is examined. A systems response allows designers to understand how the world works and how the 'products' they design can work with the world and not against it. This paves the way for the design of reformist solutions that may not invariably be a single product but an entire system that incorporates natural, artificial and human elements.

A progressive development from the idea of merely providing services in the place of products (which is a solution offered by many sustainability experts) is the complete redesign of the product service system and its replacement with a more sustainable system, which has a lower material and energy requirement and also exerts positive social and economic impact.

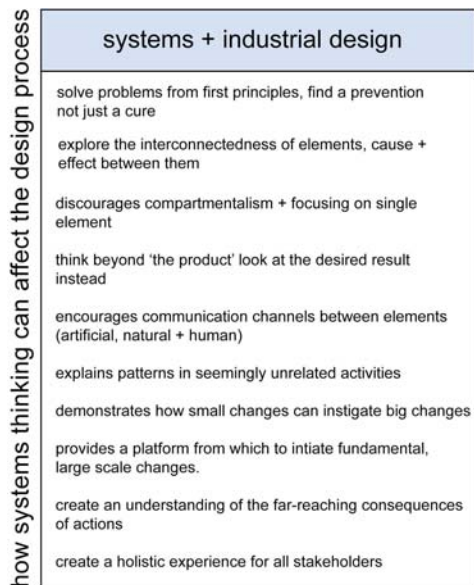
## DESIGN MEETS A SYSTEMS APPROACH

Current product design and development practices tend to reduce a problem to its constituent parts and attempt to resolve each part individually, with 'experts' working at the separate stages. This is the antithesis of Systems theory, as having successful elements does not mean having a successful system. Within systems the interactions between the constituent parts is oftentimes as important as the parts themselves and in order to resolve a problem successfully a holistic look at every stage and the interplay between them is essential.

A systems response encourages designers to consider all approaches to Sustainable Design and apply the different elements where necessary. Within this solution the focus of Product design is shifted to a Systems approach, where the desired 'result' becomes the initial problem to be resolved and not the product itself. Designers are encouraged to return to ground zero of a problem and begin to solve it from here. Systems design allows for the integration of services and products that consider all aspects of a task (every element of the life cycle and all stakeholders involved) in a cyclical manner, whilst encouraging the creation of a framework where disparate disciplines, objects and theories can be combined in a non-linear way.

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<sup>2</sup>Chaos Theory is where even small changes to the equilibrium of a system can magnify/echo to cause extremely large effects within it (from interview with Donal McMahon Mathematician & Statistician).



Radical solutions and system restructuring needs leaders. It can be argued therefore that designers can potentially lead and not follow. The recent Scoping Report from the British Design Council states that even though designers may be placed far down the product development process and other sectors within industry often play bigger roles in developing new solutions, the skills they hold are perfect in driving a path towards Sustainability [14]. These three and two-dimensional skills include Visualisation; Storytelling; Ergonomics; Presentation; Prototyping; Computer Modelling and above all the creative ability to generate original ideas. As problem solvers designers understand consumer behaviour and motivation and also the language spoken by industry and business. Design is a creative process capable of developing ideas in an imaginative way that other business and engineering models may not. Designers have the vision to predict a sustainable future, and to marry these visions with both user needs and industry requirements.

Figure 1: How Systems thinking can affect the design process

### HOW DO YOU WORK?

In order to ascertain how designers perceive their roles within the realm of Sustainability and where they believe they can or cannot exert influence over changes, it was necessary to consult with practising designers. On this premise a series of interviews were conducted and an informal forum held where designers were encouraged to exchange their ideas and opinions.

When the topic of sustainability was raised it was met with a little scepticism and trepidation (to say the least!). It transpired that the designers didn't have full knowledge of the subject and so were reluctant to comment on how they could incorporate the principles in their design work.

Secondly the issue of the role designers should play in introducing Sustainability principles into projects arose and how much power they could personally exert in bringing about these changes. Designers felt they had little influence to introduce these topics, as the companies they worked for gave them minimum time and encouragement to deviate from the established method of completing a project. The goals of the business are very different from those of the designer who wants to initiate responsible practice. Chris Sherwin in a recent article found that that design is often introduced into a project too late, key decisions have already been taken and significant changes are almost impossible by the time designers inputs are asked for [15].

During the interviews one designer observed that companies regularly provide too restrictive a brief and immediately the scope of the project is limited and the opportunity for innovative or radical solutions eliminated. Companies often know exactly what they want and are unwilling to explore novel concepts; the status quo wins out over innovation, as innovation is perceived as more expensive and time-consuming. As a result designers have little opportunity to introduce new parameters or ideologies into the process and also have little time for personal development (e.g. expanding their knowledge base on topics such Sustainability).

When questioned as to whether they considered sustainability issues in their designs the answer was a very honest 'No'. The reasons for this were similar to those given to the power to change questions, the time was not available and it was not a pre-requisite from their companies. In addition to this they themselves knew nothing about how to integrate Sustainability into their daily practices; this highlighted the need for tools to be provided to designers to enable them to consider sustainability in their projects. Some of such tools (L.C.A.<sup>3</sup>, Environmental Checklists & Matrices or Stakeholder Assessment and also Continuing Professional Development programmes) were discussed but none of the participants had ever used or even been given the opportunity to use them within their business'.

*'I think that every designer dreams of making work that makes a difference'* [16]. The designers both in the interviews and during the forum expressed a desire to include sustainability considerations in their work, as they were personally concerned about the impact their products were having on the environment. This reflects a conflict between personal and professional desires.

<sup>3</sup> L.C.A.: Life Cycle Analysis

## DEVisING THE TAXONOMY

Stemming from the initial research it was observed that practising designers didn't have a large amount of knowledge as to what Sustainability and Systems theory actually meant and how it applied to their specific field. Like in any discipline, if designers are asked to modify their working practices then they must be shown how. On this premise a Taxonomy was devised which outlined the parameters of designing a system instead of a product and was to be used as a guide for the designer when undertaking a systems driven project. This taxonomy encourages designers to explore novel solutions from first principles in a project. It harnesses the designer's creative ability to find interesting, different answers and requires that they adopt a holistic approach to the solutions they generate. The taxonomy is seen as the first step in encouraging designers to approach projects with a systems response.

Most importantly the taxonomy recognises that designers are above all else problem solvers so the secret to motivating them is to make them feel there is a problem worth solving [17]. If the goals set for them were aggressive and different from the norm, they would be forced to shun incrementalism and instead (to use a cliché) think outside the box for new ideas [18] Designers must be brave and willing to stretch the boundaries and limits of known solutions. Concept generation is the stage where the most novel ideas are born; more emphasis must be placed on this in order to place greater emphasis on innovative and progressive solutions. Only then can '*...Designers...rightfully own the power of design to intend, to manifest and to lead*' [19]

a taxonomy for systems design	
<ol style="list-style-type: none"> <li>1- Begin problem solving from first principles.</li> <li>2- Holistic view, consider every element of the system. Recognise the interconnectedness of elements, how they can impact positively or negatively on the other elements.</li> <li>3- Remember the interplay between elements can be as important as the elements themselves. Encourage 'partnerships' between elements (sharing of parts, symbiotic relationships)</li> <li>4- Steer away from 'compartmentalism', incremental improvements should be abandoned in favour of alternative solutions. Move the focus from 'Products' to the entire system.</li> <li>5- Look to Natural systems to understand the complexities involved.</li> <li>6- Think beyond product solutions to result-oriented solutions.</li> <li>7- Involve all stakeholders. Think about the needs of the stakeholders.</li> <li>8- Forge clear and open channels of communication between all elements (natural, man-made and human). Effective communication is the key to the functioning of any system.</li> <li>9- Cyclical design to replace linear thinking. Understand cause and effect of every action and element within the system.</li> <li>10- Must understand that even the smallest changes can impact heavily on the functioning of the system (Chaos Theory).</li> <li>11- Thinking from a systems perspective gives designers the power to instigate radical changes, as it forces designers to look at the bigger picture.</li> <li>12- Have a clear understanding of functionality in order to pre-empt problems, this allows designers to understand the limitations as well as abilities within the system.</li> </ol>	<ol style="list-style-type: none"> <li>13- Look at the environment in which the system operates, systems respond to ambient changes.</li> <li>14- Allow for cross-disciplinary and cultural collaboration.</li> <li>15- Flexibility must be inherent within the system, systems cannot be rigid.</li> <li>16- Be prepared for the unpredictable (systems are constantly changing due to their emergent properties)</li> <li>17- Remember the longevity of a systems solution (they take time to create, to implement, to settle, to operate and so tend to 'live' longer), allow for adaptive measures if the system needs to change over time.</li> <li>18- Systems can tell the story of a better way of doing things, through the narrative and personality of the system.</li> <li>19- Utilise technological and other modern advances for positive impact.</li> <li>20- Use a systems approach to create and heighten awareness whilst also encouraging more sustainable lifestyles.</li> <li>21- Consider the entire lifecycle of the system including where all the separate elements will go when they leave the system.</li> <li>22- Systems solutions can incorporate products, services, natural elements and human capital.</li> <li>23- Create and encourage sustainable lifestyles. Re-establish a sense of community, of sharing and interacting in an effort to begin rebuilding trust within society.</li> <li>24- Rely on Nature to guide and teach. Respect the inherent connection between Man and Nature (harmonious not conflicting).</li> <li>25- Be Fun, Exciting, Progressive &amp; Dynamic.</li> </ol>

Figure 2: A Taxonomy for Systems Design

## TESTING THE HYPOTHESIS '*WASHING DIRTY LAUNDRY IN PUBLIC*'

The next stage of the project involved the modification of the taxonomy for systems design into a short exercise to be completed by a number of professional designers working in international design firms. The project was presented in a format designers are comfortable with: A Design Brief. The brief was developed from an adapted version of the taxonomy. A problem was selected and the designers asked to envisage possible system solutions to it. The problem chosen was 'Clothing Care'<sup>4</sup>; this term was applied in place of 'Clothes Washing' so as to allow the participating designers to conceptualise for more radical solutions than the mere redesign of the existing washing machines. The Designers were asked to brainstorm for conceptual ideas to the problem of Clothing Care within the community environment, taking particular consideration of the idea of sharing facilities in order to address the issues of consumption whilst also stimulating interaction and cumulative responsibility amongst community members.

The objective of the exercise was to introduce the concepts of Sustainable Design and Systems thinking to a group of practising designers (concentrating in the consumer product sector) with the intention of beginning to

<sup>4</sup> The Term 'Clothing Care' was borrowed from the Sustainable House Project conducted in Europe in 1999.

encourage designers to respond to a problem from a systems perspective. It was also devised to assess how closely designer's current practices adhere to or conflict with systems thinking, how they employed this method of thinking into their solutions and whether their current skill-set is sufficient to consider projects from a systems perspective. The designers were asked to approach the brief with an open mind, rid themselves of preconceived ideas and to shift away from the usual product focus of an Industrial Design project. It was hoped that through this designers could find a way to tell the story of a Sustainable Future.

It was apparent from the ideas which emerged from the exercise that the designers were finally beginning to grasp the principles of Sustainable Design, as the three pillars of sustainability (Economic, Environmental and Social) were considered in the majority of the concepts. The designers all approached the brief from different perspectives, some choosing to focus on specific aspects of dematerialisation (resulting in the elimination of washing machines from the domestic environment). Others focused on 'financial' incentives for motivating responsible behaviour and more on social interaction (one concept developed was where users wash their clothes together in an almost therapy-like activity, venting their anger on their clothes would have more than one positive benefit). In response to the privacy and ownership issues that arise in shared solutions, several concepts developed included an element of personal product possession within the communal systems in order to satisfy the human need to acquire and possess objects.

The concept solutions offered ranged from individual pods which would be sent through chutes to central areas to be cleaned, to laundry gyms where the kinetic energy generated during exercise would power large washing machines and enhanced communal areas where the activity of clothes washing could be married with social activities like dining and play; from washing clubs to unite community members to 'make-your-own' uniforms for school children using second hand fabric remnants; from spray on laundry detergent to impenetrable force-fields that surround the body negating the need for clothes in the first place and the offering of environmental vouchers!. The ability for creative thought in the designer cannot be denied. One designer even looked at an improving and upgrading an existing scheme used prolifically in Portugal until recently where consumers would come to a specific area kitted out for washing not only to clean their clothes (the task is undertaken in large basins placed side by side and fed by water from natural springs) but also to interact with others creating a sense of community and cohesion. The wide variety of solutions offered is a clear indication that designers are capable of generating innovative and dynamic solutions.

This short exercise explored the practicality of using systems thinking to conceptualise for creative innovative ideas outside the limitations of traditional business constraints. Some of the concept solutions presented by the designers are very pragmatic and with additional time and resources they could be explored more thoroughly with the possibility of implementing them on a trial basis. Others are more conceptual with their implications more forward thinking. On the whole fresh, novel ideas were created by the designers, and from the analysis of these concepts we can conclude that although systems thinking can be married successfully with the design process there remains a need for further exploration and development. Designers have the potential to push projects beyond mere palliative solutions, they are (or should be) at the inception stage and in theory have the power to positively influence the development of a design solution.

Initially some of the designers expressed concern at not being able to generate a solution to the problem posed. Some stated that they were confused at first and the project got them thinking in a new way, as the requirement was not simply a product like they were used to, instead what was required was a total system redevelopment, requiring them to go beyond their training. However, after mulling it over and considering the issues involved the project became clear and solutions began to present themselves. This indicates that Systems Thinking is not totally beyond the realm of the designer's current expertise, although they need the time and access to more resources (both human and artificial) and perhaps more motivation from industry to apply the methodology in all of their projects. Below are a few steps on a path to integrating systems thinking into all design projects in a pragmatic and positive way.

## **PATHWAYS TO SYSTEMS THINKING**

*Moving Forward/ Clarity-* Unambiguous, objective information explaining exactly what sustainability means and clearly identifying designer's roles and obligations is essential. Research has shown that designer's knowledge of sustainability is limited; this is a relatively new area (in particular for designers) and the subject must be made clear so designers can decide upon their role within it. Designers need to have the tools of change made available to them.

*Education-* Sustainable Design principles and Systems Theory must be an inherent part of every design programme ergo it will become an inherent consideration in every design project. Designers need the competence to engage with problems on a systems level. Providing access to relevant information and continuing development programmes for practising designers would also ensure progress within the professional

realm. Pressure from an educated and aware design force would help to bring about a sea change in consumption patterns.

*Creative Leaps-* Incremental improvements are happening and this is undeniably a good step, however without creative leaps then paradigm changes will never happen; changes that will alter malignant patterns. Designers must reconsider these patterns from a first principles perspective and introduce entirely new and more sustainable methods of doing things. Designers need to nurture their creative streaks, embrace diversity and change and allow themselves to freely explore radical ideas.

*Experimentation-* Designers must be given the freedom to experiment with ideas, create small-scale trials of innovative systems solutions (supported by government, through finance and infrastructure). Designers are above all else visionaries, problem solvers and innovators and they must be given the opportunity to realise this potential. Systems modelling tools (which allow designers to predict the operation of a system) as well as CAD tools could be employed to help designers to understand the intricacies and complexities of system solutions.

*Communication-* Open lines of communication between all stakeholders and actors are a pre-requisite of any systems project. If the solution is to be a holistic solution for every-one, then they should all be consulted in the developmental stages. In addition to this designers must understand the connections between the elements within the systems. Creating pragmatic networks of like-minded experts in local hubs around the country or in the form of online forums would facilitate these communication channels and encourage debate and discussion.

*Co-operation-* In addition to unambiguous communication Ideas exchange, multi-disciplinary teams could be established in order to solving problems collectively. Co-operation from government, local authorities, environmentalists, business, marketing, media, trend forecasters, sociologists, psychologists, and materials experts and of course consumers<sup>5</sup> would ensure all stakeholders are satisfied with the new approach. Systems projects require a system of creators. Designers however could be the innovators and lynchpin within the system design process; they must work with others as they cannot do it on their own. Inter-sectoral collaborations would be key in bringing about the changes.

*Early Inclusion-* Research led to the conclusion that designers are often considered too late in the product development stages. They must be considered from the very start and asked not to address the product but the entire problem.

*Opportunity -*Designers need to be given more opportunities to implement innovative for dynamic changes, their roles within the problem-solving sphere must be recognised. Business must recognise the potential design offers as there will be no alternative but to adopt different ways of doing things as clearly our current pattern of consumption cannot continue. Designers must be given more influence and responsibility within the product development and design phases.

*Cohesiveness-* Systems are cyclical in nature. Designers must understand the relationships that exist between all of the elements within the system (natural, man-made), as well as recognising the symbiotic nature of systems where every element can positively influence the others. Design must not happen in isolation and designers must recognise the intrinsic links that exist between everything.

*Holistic Picture-*Designers must think beyond individual products to the bigger picture. Readdressing the problems from a systems perspective allows for radical and innovative solutions where sustainability issues have been considered from the start. The focus of design projects will have to shift from compartmentalised product designs to holistic systems design. Systems' thinking requires macro perspectives, seeing the bigger picture, not as 'objects' but as 'results'.

*Understanding-* From the designer's perspective an understanding of human behaviour and motivation is required so as to create solutions that are less damaging to the environment and more conducive to better social and ethical behaviour. Including User Behaviour modules in design education and emphasising dynamic, iterative user research at all stages of a project would begin to push designers to marry user needs with practical requirements. People need to be given an alternative ways of fulfilling their needs that encourages participatory behaviour whilst also enhancing the user experience.

*Dynamism-* An organic design processes must be advocated, as systems are in a constant state of flux. System design solutions must respond to the changing needs and desires of all its elements and designers must be able to bring about these changes.

*Money Talks-* System thinking embodies a promise of sustainable innovation for industry, consumers and all stakeholders involved. It also offers opportunities for business' to create new solutions for consumers by extending the consumer-system relationship (service, repair, replace) and to look at economic progress in a different way, not as fast growth but more as a sustained steady economic expansion.

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<sup>5</sup> This list is not exhaustive, however as it is impossible to list all of the stakeholders involved in any system.

*Storytelling-* As well as being problem solvers Industrial Designers are storytellers, in order to 'sell' system changes they must use their visual skills to tell the sustainability story. Designers must give shape to the new ideas so they are tangible and real to consumers and business in order to gain widespread acceptance.

*Gaining Participation-* Gauging public response will be difficult as they are often sceptical when it comes to new ideas. And although it may seem to contradict the notion of creative leaps, one method of overcoming this barrier may be to introduce the ideas incrementally, judge responses and introduce new elements into the system as consumers begin to accept or reject the ones already in place. It is important not to over estimate the public's positive reaction towards new schemes. Might even be a possibility to pilot the schemes in a neighbourhood where the level of sustainability practice or even environmental awareness is already high (e.g. an eco-village)

## CONCLUSION

The project was met with a positive response; all of the designers who participated expressed a wish to consider sustainability issues in their design solutions. It achieved its aim of setting designers to think about projects from a sustainable perspective and to approach them in a systems manner.

Designers have the potential to push projects beyond mere palliative solutions, they are (or should be) at the inception stage and in theory have the power to positively influence the development of a design solution. However, in order to alter underlying problems inherent in a system a holistic approach to problem solving is essential. The inclusion of Sustainability issues will undoubtedly challenge designers to refocus their work; all of the designers who participated in the project recognised the need for this type of approach so as to begin to resolve the issues we are faced with. They couldn't ignore that there was a problem worth solving and wanted to have a positive influence in solving it. Although the barriers may appear insurmountable, Sustainable Design offers great potential and opportunities for progress. And within this, Systems thinking incites designers to respond to change and expand their knowledge and influence by envisaging sustainable futures. The small steps are easily taken, but without great visionaries and utopians however, we will never have the creative leaps that will forge our future; dynamic open-minded and experimental designers are the proponents of these leaps.

### References:

- [1] CHAPMAN, J., 2005, Emotionally Durable Design: Objects Experience & Empathy', London, Earthscan.
- [2] BAKKER, C., 1995, Environmental Information for Industrial Designers, Rotterdam, Connie Bakker.
- [3] SEYMOUR, R., April 2005, High Hope, Design Week, Vol.20, Part 16, pages 14-15.
- [4] ROGERS, R., 1997, Cities for a Small Planet, London, Faber & Faber.
- [5] GERTSAKIS, J. & LEWIS, H., 2001, Design + Environment, U.K., Greenleaf Publishing.
- [6] COOPER cited in VAN HINTE, E., 1997, Eternally Yours, Rotterdam, 010 Publishers.
- [7] BEHRENDT, S., JASCH, C., KORTMAN, J., HRAUDA, G., PFITZNER, R. & VELTE, D., 2003, Eco-Service Development: Reinventing Supply & Demand in the European Union, U.K., Greenleaf Publishing
- [8] WALKER, S., 2005, After the End-Game: Creating objects in a Saturated Culture The Design Journal, Vol.8, Issue 1, pages 3-13
- [9] PAPANEEK, V, 1972 (2<sup>nd</sup> edition 2000), Design for the Real World, London, Thames & Hudson.
- [10] LITTIG, B, Eco-Efficient Service for Private Households: Looking at the Consumer's Side, in Towards a Sustainable Work life – European Approaches, Berlin: Edition Sigma. pages 231-246.
- [11] CLAYTON, A. & RADCLIFFE, N.J., 1997, Sustainability: A Systems Approach, U.K., Earthscan Publications Ltd.
- [12] O'CONNOR, J. & MCDERMOTT, I., 1997, The Art of Systems Thinking, London, Thorsons.
- [13] Interview conducted with Donal McMahon MSc (Mathematician & Statistician) on 9-8-05
- [14] RICHARDSON, J., IRWIN, T. & SHERWIN, C., 2005, Design + Sustainability: A Scoping Report, for Sustainable Design Forum DEFRA; Available from [www.designcouncil.org.uk/RED](http://www.designcouncil.org.uk/RED) (accessed on 13-07-05)
- [15] SHERWIN, C., 1999, Service Design from Products to Service, Cranfield University, Internal Report.
- [16] [ed] LAUREL, B., 2003, Design Research, Methods & Perspectives, Massachusetts, MIT Press. [16] CHAPMAN, J., 2005, Emotionally Durable Design: Objects Experience & Empathy', London, Earthscan.
- [17] SEYMOUR, R., April 2005, High Hope, Design Week, Vol.20, Part 16, pages 14-15.
- [18] Jackie Ottoman, from o2 discussion posting 12-07-05 .www.o2.org
- [19] [ed] LAUREL, B., 2003, Design Research, Methods & Perspectives, Massachusetts, MIT Press. [16] CHAPMAN, J., 2005, Emotionally Durable Design: Objects Experience & Empathy', London, Earthscan.