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## INFORMATION/INSPIRATION: A WEB BASED SUSTAINABLE DESIGN TOOL

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### **Abstract**

This paper presents the results of research ongoing at Cranfield University to establish useful tools for designers to aid them in the process of sustainable design. Research completed as long ago as 1999 at Cranfield University [1] identified that to be successful, sustainable design should be considered at the earliest stages of PDP, where the design brief is most flexible. Despite this, research has shown that many companies do not have the appropriate mechanisms to integrate sustainable design early in the product development process and that there is a lack of appropriate tools. Many tools are available under the general heading of sustainable design but recent analysis [2] of these tools shows that the majority either focus on setting the strategic direction or are reflective tools such as life cycle analysis. Both of these types of tools do not aid designers in the early stages of product development. Research at Cranfield University has developed a greater understanding of the type of criteria required of a sustainable design tool in order to make it more appropriate to industrial designers. One of the deliverables of this project has been a sustainable design web based tool that combines sustainable design information with a selection of inspirational ideas. This paper presents the results to date of the research, outlines the tool and gives examples of its use.

*Keywords: Sustainable Design, Design Tools*

### 1. Introduction

This paper introduces a new way of presenting ecodesign tools to Industrial Designers, which takes into consideration and is more appropriate to design culture. It outlines a number of the findings which emerged from a three year collaborative research project between Cranfield University and AB Electrolux, regarding the problems with current ecodesign tools. It then goes on to present ways in which these may be overcome, focusing on the type of service presented, the content required, the style of presentation and the mode of access provided. The empirical evidence was collected from a broad range of design based case studies in order to develop the web based 'Information/Inspiration' tool. Finally a descriptive framework is presented to aid the development of future ecodesign tools. Conclusions are drawn regarding the benefits of using this type of tool.

### 2. Methodology

Within the research two studies were undertaken in order to establish a better understanding of the problems faced by designers involved in ecodesign. During the initial study a wide range of data was collected via an in depth case study of Electrolux and four broad surveys

which drew data from a variety of sources, including; designers in large multinationals, novice designers, design consultants with little experience in ecodesign, ecodesign experts and personnel within environmental affairs departments. Qualitative data was collected via a range of different techniques, such as semi-structured interviews, active and passive observation, and literature and web surveys [3]. At the end of this study a prototype version of 'Information/Inspiration' was built using the findings which had been obtained.

During the second study this prototype was used to obtain feedback from twenty one different cases in order to test the accuracy of the data collected in the initial and the appropriateness of the way in which these findings have been translated into reality. Again data was collected via a number of different mechanisms such as 'web-based feedback', open ended interviews and observation [3]. The data that was obtained during this part of the was analysed using a coding and clustering approach, common in qualitative research [4-6].

### 3. Problems with existing ecodesign tools

Ecodesign literature shows that many existing tools fail because they do not focus on design, but instead are aimed at strategic management or retrospective analysis of existing products [2]. It is also considered that they also do not take into account the culture of Industrial Design and the fact that industrial designers may have 'their own way' of carrying out ecodesign [7]. The fact that many ecodesign tools are unsuitable for Industrial Designers was further consolidated by the early empirical work carried out with the Electrolux design team. Many of the designers indicated that they felt they did not have the correct tools to support them in carrying out ecodesign. The empirical data collected during the initial study helped to develop a more detailed understanding as to why the tools available were inappropriate and not used by Industrial Design. The main issues identified are described below within four categories; service, content time and style.

#### 3.1 Service

The designers involved in the initial study felt that existing ecodesign tools failed on a number of accounts. Primarily, they felt they did not recognise that ecodesign is not a priority issue but one of a number of things that designers have to contend with. Secondly, many of the designers complained that the tools available did not show them how to *do* ecodesign. Although the tools did help them to highlight the issues they needed to consider, there was no support provided to help them take these issues further, nor any support for designers who did not know where to look for ecodesign information – a common complaint. Comments were also made ecodesign checklists were often too general and therefore misleading, with others finding them to be overwhelming, seeing them as an imposing list of requirements to be added to an already taxing design brief.

#### 3.2 Content

In terms of the content provided by the tools many designers felt that the available tools did not provide relevant information for designers. Additional research also showed that asking designers to consider irrelevant issues (such as the environmental impact of the extraction of selected materials) often has a negative effect and can alienate them from ecodesign [8]. The findings from the initial study strongly suggested that industrial designers need content which is specific to design and design issues rather than general environmental information.

### 3.3 Time

In the cases where the participating designers were familiar with ecodesign tools, the feedback highlighted that these tools were too time consuming to be carried out on a regular basis. For example, many of the established ecodesign tools available, such as the LIDS wheel [9] and the EcoReDesign programme [10] require the whole production team to spend a day together to map out the ecodesign process and plan future directions for the project. In general, this is incongruous with the way in which design teams tend to work. The findings suggest that in order to compliment their way of working, designers need ecodesign support mechanisms that can be used by individuals on a less formal basis, as and when required.

### 3.4 Style

One of the biggest problems with the existing ecodesign tools lies with the presentation styles that they use. It is common practice for environmental teams to provide ecodesign information to design teams in lengthy technical documents full of graphs and wordy, technical explanations. However, both the literature and empirical evidence demonstrate that designers spend little time reading and generally only read things they are interested in or are appropriate to the project that they are working on [11]. As such, evidence shows that designers do not react well to manuals and often ‘file’ them, rather than use them.

## 4. Criteria identified for design focused ecodesign tools

As a result of the findings obtained from the second study four criteria were identified as being important to the success of ecodesign tools for designers. These are outlined in the sections that follow.

### 4.1 Service

The research identified that contrary to previous ecodesign tools which have tended to focus on guidance, education or information provision, designers are actually looking for tools that combines all three elements. In terms of the individual elements, the findings showed that designers are looking for simple guidance in the form of a ‘short and punchy’ lists of issues, in order to simplify the number of issues they need to consider at the beginning of the ecodesign process and act as a basis for their ecodesign work. They are also looking for simple, relevant, product focused information to support specific elements of their current projects. Finally the designers were using the prototype to raise their awareness with regards to the types of issues they need to consider and furthering their understanding as to what ecodesign is.

It is however the interaction between these three areas where the particular value lies. For example, the combination of information and guidance meant neither information nor guidance was provided in isolation and that users could identify important and then follow them up through links to more practical design focused information. The combination of education and guidance meant that the designers could use the prototype to find more out more about the subject. In fact the feedback illustrated that they needed even more in terms of education and guidance, as designers wanted more guidance in terms of ‘which strategies were the best to tackle first’, and ‘which materials are better to use and when’.

The value in combining education and information was demonstrated by the way in which some of the designers were referring to the tool as they might a magazine, looking for

'snippets' of ideas which interested them. Presenting information in this way meant that the tool acted as a resource from which they were able to build up tacit knowledge on ecodesign.

## 4.2 Content

The findings from the second study clarified the idea that designers are looking for two types of content - inspiration and information. Through the study it was recognised that case studies from wide range of industry sectors have a valuable role to play in supporting and encouraging idea generation and in allowing designers to build up tacit ecodesign knowledge that they can draw on later.

It was also recognised that traditional ecodesign information can be very valuable to design, if presented in a way which is appropriate. It was seen that designers need ecodesign information, with a similar focus to that which they would use in regular design projects (i.e. materials information, fixings opportunities, relevant legislation). In addition to this, the findings suggested that providing additional ecodesign information with a product focus, is also of benefit to designers. For example, providing detailed information within the case studies on 'the strategies used', 'how it works' and 'where to buy it' allows designers to learn from the case examples and apply their new knowledge to their own designs. This reflects design practice in 'regular' design when designers take competitors products apart to study how they were made etc. This type of information has a fundamental role in educating Industrial Designers and in providing them with useful information that can be transferred to other projects.

The findings from the second study emphatically demonstrated the benefit of combining ecodesign case studies and ecodesign information, showing that linking ecodesign information with examples, makes the information interesting and relevant whilst the information helps to bring the examples alive, making them real and tangible to designers.

## 4.3 Style

The findings from the second study also emphasised the importance of presenting information in a way which appeals to designers and supports their culture of fun. All the sources of information indicated that designers like information to be presented creatively with maximum use of graphics (pictures and colour) and minimal text, that they like to be stimulated with images and are happiest with 'nuggets' (small pieces) of information that can be easily digested.

It was also recognised that designers' favour a non technical approach and need ecodesign information presenting in a language that they understand and are interested in, rather than in the traditional language of environmental scientists. Finally it was recognised that in developing ecodesign tools it is important to avoid tools that can be perceived as being academic or theoretical, instead they should be based on practice.

## 4.4 Access

During the study, two issues regarding the access of information were identified; that designers were only interested in looking information that was relevant to their current projects, and that they were ideally looking for a tool/resource that took up as little of their time as possible.

This type of accessibility need recognises that ecodesign is not a priority issue but one that has to be considered alongside all other aspects of product development and suggests that a

tool that can be easily referred to as and when required, would be most appropriate to their needs.

## 5. Information/ inspiration – the tool

The criteria outlined in the previous section were used to develop the ‘Information/Inspiration’ web tool that is described in this section. The tool became known as ‘Information/Inspiration’ for two reasons. Primarily, the name described the unusual combination of content provided by the tool. Secondly, it was felt that using a new and unusual name that placed more emphasis on the creative nature of the tool, would reduce the likelihood of the designers prejudging it as ‘another one of *those*’ ecodesign tool.

A web based format was chosen as it was felt that it supported many of the requirements identified as important in the initial study:

- providing the potential for the content to be presented in a highly visual and interactive way, making it very relevant to the designers’ way of working.
- offering the opportunity for the amount of reading to be kept to a minimum.
- supporting the opportunity for the user to access it on demand, thus enabling designers to integrate it easily into their daily practice.
- providing a good opportunity for the ecodesign information to be kept up to date.

The ‘Information/Inspiration’ website consists of two streams, one providing information (‘Information’) and the other providing inspiration (‘Inspiration’), connected by a Homepage as illustrated by the schematic diagram in Figure 1.

The navigation structure in Figure 1 illustrates the tiered system that is used to keep text to minimum and allow users to delve into the site to an appropriate level. In addition to this, the arrow ‘A’ illustrates the links which exist between the two sides of the site and the red box and dotted line ‘B’, represents links which exist to external web sites. From the Homepage (Figure 2) the user can select either the ‘Information’ route, for specific detailed information, or the ‘Inspiration’ route for inspirational ideas on ecodesign. This action would take the user to one of the two pages illustrated in Figure 3.

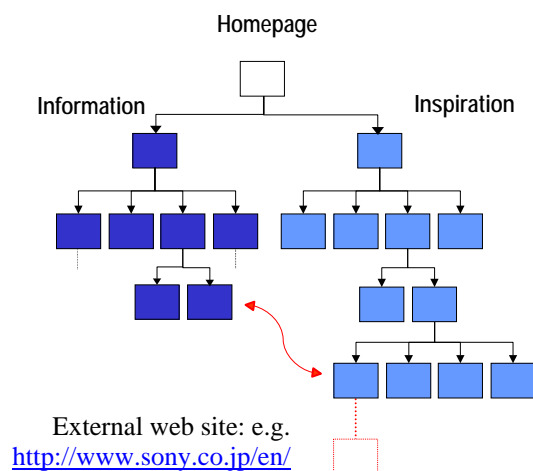


Figure 1 A schematic diagram of the navigation chart for ‘Information/Inspiration’

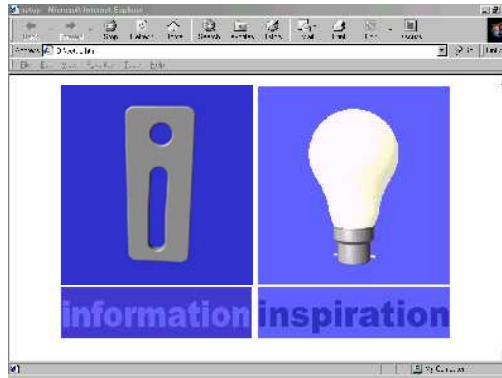


Figure 2 The Home page of the 'Information/Inspiration' web tool

Navigation through the website is made logical through the implementation of a consistent graphical theme [3].

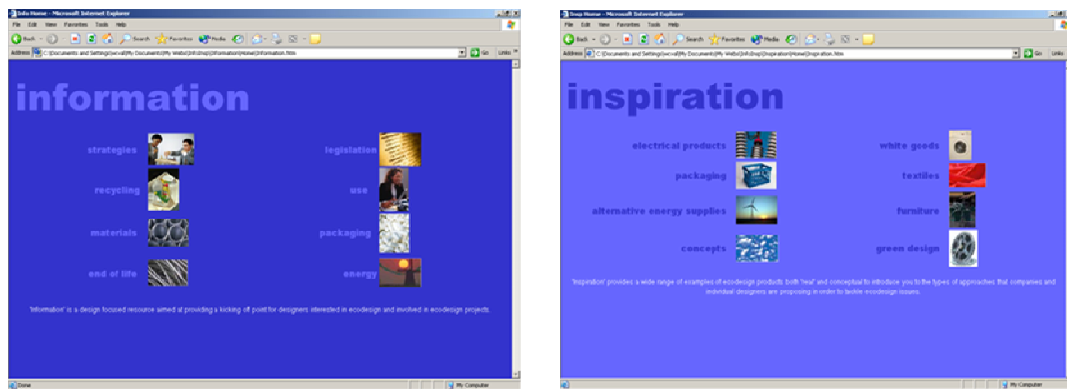


Figure 3 Visual menus for 'Information' and 'Inspiration'

## 5.1 Information

Within Information the content was presented via the eight categories introduced at the beginning of this section; 'strategies', 'legislation', 'recycling', 'use', 'materials', 'packaging', 'end-of-life' and 'energy'. The information provided aims to be as appropriate as possible to the type of work that industrial designers become involved in.

The first page in each category contained a bulleted list of basic points that designers should consider. For example the 'materials' section included amongst other things information such as: 'Less is always better', 'Select materials which are compatible for recycling where possible, 'use materials with recycled content where possible' (see Figure 4). Where appropriate this information is hyperlinked to another page, which provides more detailed information.

Within each sub-category data is provided as 'nuggets' of information and illustrated with images wherever possible [12, 13]. For example, within 'recycling', data was broken down into bullet points and short lists of 'rules' were provided;

- Minimise the number of separate components and materials;
- Avoid glues, metal clamps and screws by using alternative fastenings such as 'push, hook & click' assembly methods;

- Make fasteners from a material compatible with the parts connected;
- Design interconnection points and joints so that they are easily accessible



Figure 4 Materials page in 'Information'

Each one of these points is connected by a hyperlink to more detail on the subject. In addition to this, a series of questions such as "Who is going to disassemble it?" and "Can the disassembly rely on specialist tools?" are posed to encourage designers to think more holistically. The layout or structure of 'Information' is such that each section provides guidance or checklists on the subject selected. This came about partly in response to the need for 'nuggets' of information and partly in response to the request for guidance and simple targets.

## 5.2 Inspiration

Within 'Inspiration' the case studies are grouped according to the product type, for example; 'electrical products', 'white goods', 'packaging', 'textiles', alternate energy supplies' and 'furniture' with additional sections containing 'concepts' and examples of 'green design'. The aim of 'Inspiration' is to encourage, inspire and educate designers, by providing them with product examples of ecodesign work, to help them build up their tacit ecodesign knowledge, and/ or support idea generation at the beginning of an ecodesign project. Selecting an image in the 'Inspiration' visual menu (Figure 3), for example, the 'electrical products' image, takes the user to a sub menu page (see Figure 5).



Figure 5 Electrical products sub menu within 'Inspiration'

Clicking on the image of the Cartridge Swapshop, in the bottom left of the page, takes the user to the page type in Figure 6. Each product page in 'Inspiration' provides an enlarged



image of the product and a brief description containing a number of facts, such as, a description of the product; its function, and the ecodesign strategies that have been employed to improve its design, e.g. materials composition, energy source etc.

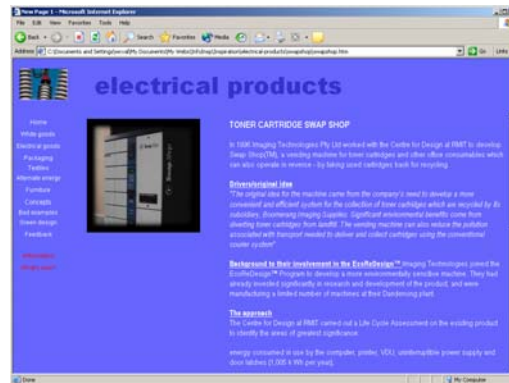


Figure 6 Cartridge SwapShop example in 'Inspiration'

It is hoped that future developments will include working drawings of the type used to back up patent applications, to provide designers with even more detailed information. Finally, many of the product examples in 'Inspiration' have web links to further information, such as the company home page or stores where the item can be purchased, allowing the designers to further investigate them if required. Wherever possible throughout the site product examples are linked to more detailed data within 'Information'. For example, the case study of the Sony loudspeaker cabinets made from Tetra-pak material [14], presented in 'Inspiration' is hyperlinked through to more information Tetrapak (Tectan) material within reported in 'Information'.

## 6. Descriptive Framework

This research has resulted in a better understanding of the types of support mechanisms that industrial designers require for ecodesign. The prototype tool 'Information/Inspiration' has provided a first attempt at achieving this, and proven to be more appropriate to industrial designers needs than has previously been achieved. Through testing the prototype a more detailed understanding of the service, content and style of presentation required, has been identified and a number of important criteria upon which future ecodesign tools can be based, has been identified. The identification of these criteria has led to an increased understanding of the issues that need to be considered when designing tools of this nature, something which has not previously featured in ecodesign theory.

The framework combines all of the elements which need to be embodied in tools of this nature, providing a simple and quick reference tool to highlight the main findings of this research and support the development of tools based on these findings. It is important to remember that the strength of this framework lies in the combination of these elements, and therefore future tools which aim to be more appropriate for industrial designers should not be developed on a 'pick and mix' basis. It is anticipated that this framework will not only be useful in supporting the development of new ecodesign tools, but also for developing and expanding on existing ecodesign tools, which do not currently meet the needs of industrial designers.

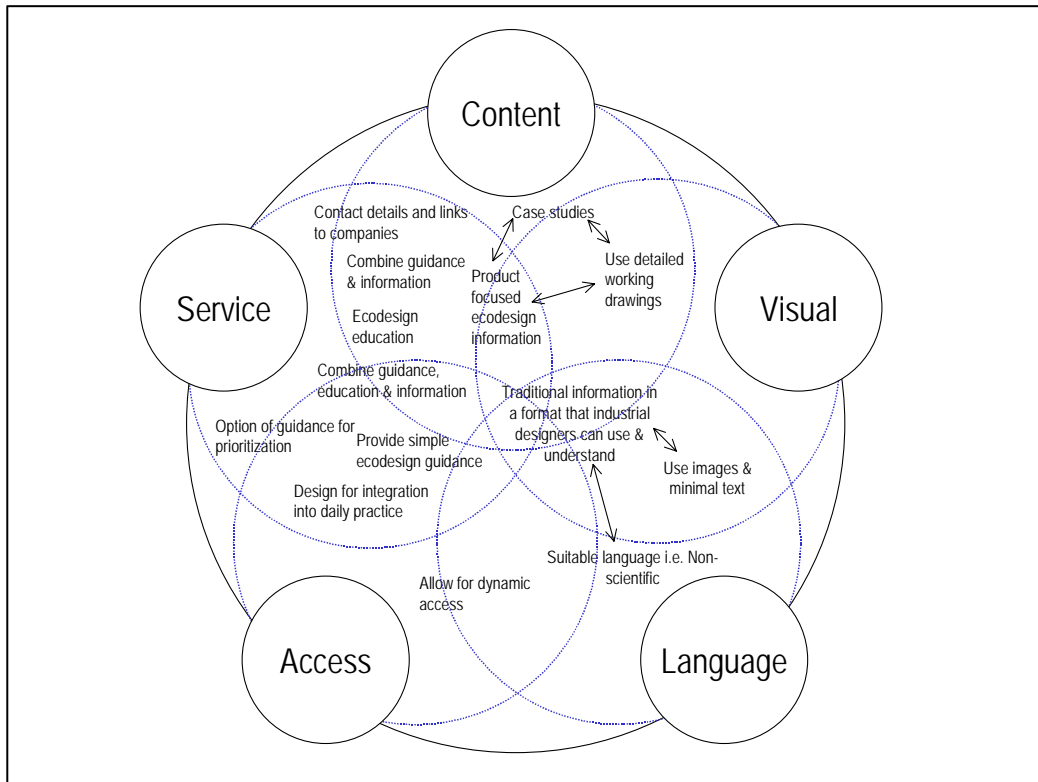


Figure 7 A holistic framework for Industrial Design focused ecodesign tools

The framework, as with the tool, is not a finished product. It does however contribute to the understanding of industrial designers and their relationship to ecodesign.

## 7. Conclusions

Through this study a new, more holistic approach to developing ecodesign tools for Industrial Designers, has been identified. The approach used is more in keeping with the culture of Industrial Designers – fits their way of working better, communicates in a language that they understand, provides a resource of relevant, product specific ecodesign information and a starting point for ecodesign. As a result, ‘Information/Inspiration’ appears to open up ecodesign to designers who wish/ need to consider ecodesign strategies within their design work as a result of company initiatives or legislative requirements. It offers a much more user friendly, design specific service to designers, providing them with guidance, education and information, allowing them to source specific data or browse for interesting ideas. The tool also appears to have helped in the development of designers’ understanding regarding the types of issues they need to consider within ecodesign, with all of the participants in the project identifying that the tool in some way raised their awareness: through an introduction to the basic principles of ecodesign; by introducing and encouraging them to think about ecodesign issues; or by providing them with more detailed ecodesign information [3].

The ‘Information/Inspiration’ tool continues to be developed with the assistance of valuable input and feedback from a range of companies within the electrical and electronic sector in the UK. Feedback is sought as to the types of content required and the appropriateness of the presentation, research into these areas is carried out and fed into the developing resource. The aim is to provide a comprehensive range of design focused ecodesign information and

interesting ecodesign examples along with guidance and education as to the types of issues which need to be considered within an ecodesign brief.

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### **References**

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