Developing a framework for analysing effectiveness of sustainable design websites in influencing design decisions

Developing a Framework for Analysing the Effectiveness of Sustainable Design Websites in Influencing Design Decisions

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Abstract

Sustainable design websites have become a key information gathering tool both in the classroom for students and also within design consultancies.

This paper aims to highlight key issues concerning sustainable design decisions and their impact on design outcomes. These are illustrated by exploring the apparent focus areas of various kettle designs, which demonstrates how weighting factors differently can have a significant impact on design outcomes. A method was devised for creating spider diagrams based on the '12 featues model of a sustainable society'. This has been used to analyse the content of 25 leading sustainable design websites. The paper then proceeds to outline the key elements of effectiveness relating to website design. The report suggests further research that will be carried out to aid in the analysis of the effectiveness of sustainable design websites in influencing design decisions.

Key words

sustainable design, effectiveness, websites, sustainability, decisions, usability

Introduction

The Brundtland report in 1987 highlighted the need for the development of more sustainable ways of living (Brundtland 1987). Sustainable development has now also become a prominent part of design and technology education with schemes such as Practical Action's Sustainable Design Award (Capewell and Norman 2003) and the Sustainable Technology Education Project (STEP) championing the movement.

Legislation, a conscious push towards more environmental, social and economic policies, and clever design resolutions have begun to lead to a change in the way we design and consume products. To this end,

a further sustainable development definition, based around Brundtland, has been developed that incorporates this idea of sustainable progression:

> …ensuring a better quality of life for everyone, now and in the future. It involves the bringing together of social, environmental and economic issues into one over-arching objective. (Daniel 2002: 2)

There are varying views of the ideal framework for considering sustainability. For the level of detail needed in this study, the 12 features model (Johnson 2003) will be used. This model was developed through an Economic and Social Research Council (ESRC) funded project at Keele University, which engaged 60 academics and practitioners. It has now been adopted by Forum for the Future (e.g. for the Higher Education Partnership (HEPS) project that was completed recently). This model of a sustainable society is a useful tool in providing a comprehensive basis for considering the different areas of sustainability. It goes into more detail than models that cover just the headings of social, environmental and economic issues.

Figure 1 (overleaf) simply outlines the 12 features as derived from Johnson (2003), and embraced by Bland (2005) on the Forum for the Future website.

12 features model

1) In their extraction and use, substances taken from the earth do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment).

2) In their manufacture and use, artificial substances do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment).

3) The capacity of the environment to provide ecological system integrity, biological diversity and productivity is protected or enhanced.

4) At all ages, individuals enjoy a high standard of health.

5) Individuals are adept at relationships and social participation, and throughout life set and achieve high personal standards of their development and learning.

6) There is access to varied and satisfying opportunities for work, personal creativity, and recreation.

7) There are trusted and accessible systems of governance and justice.

8) Communities and society at large share key positive values and a sense of purpose.

9) The structures and institutions of society promote stewardship of natural resources and development of people.

10) Homes, communities and society at large provide safe, supportive living and working environments.

11) All infrastructure, technologies and processes make minimum use of natural resources and maximum use of human innovation and skills.

12) Financial capital accurately represents the value of natural, human, social and manufactured capital.

Figure 1: The 12 features of sustainable society model (Johnson 2003)

The issues surrounding this area now essentially relate to the amount of focus and weighting on each part of sustainability: environmental, economic and social issues (Lofthouse 2001). How much attention or priority should be given over to aspects such as ergonomics or aesthetics? There are also decisions within sustainability to be made, for example, should social issues be given higher priority than more environmental resolutions?

Design decisions

Design decisions, and more specifically value judgements, have a large impact on the outcome of designs. Designers do not necessarily use eco-design as a driver (Badni and Coles 2003). The kettles shown in Figure 2 illustrate how different emphasis and weighting on specific areas can have a huge influence on product features and overall outcome. These design decisions reflected value judgements made throughout designing.

Apparent decision focus in various kettle designs

The Siemens Porsche Kettle
- Style
- Power, as evident by the short heating time (up to 100°C in just 2 minutes)
- Functionality
- Target audience, it retails at up to four times other kettles (yet both essentially achieve the same functionality)

Philippe Starck's 'Hot Bertaa' kettle
- Aesthetics (pushes the boundaries)
- Form
- Style
- Semantics, makes a statement (entices questions)

Kambrook Axis Aquarius kettle
- Energy use, reduced by 25% (energy is used in heating and reheating the water)
- Material selection, reduced by approximately 50%
- Weight
- Disassembly

Phillips filterline kettle
- Filter technology
- Material selection, introduction of polypropylene
- Cost
- Target audience, wide-ranging appeal
- Legislation

Figure 2: Four kettle designs: the Siemens Porsche Kettle, Philippe Starck's 'Hot Bertaa' kettle (Alessi) (Roberts 2006), the Kambrook Axis Aquarius kettle (retravision.com 2005), and a Phillips filterline kettle

It may be argued that sustainability issues need to be incorporated into the requirement to sell and the need for innovation. The question that designers need to address is how much weighting they should place on a certain issue over another. This also places a greater importance on innovative sustainable design resolutions through either products or services.

Sustainable design websites

The study initially looked at 25 leading sustainable design websites as a cross-section of various sustainability areas. These websites were wide-ranging and offered different information on the vast topic of sustainable design. The specific information and the presentation of it may hold a key role in influencing design resolutions.

An initial pilot study was carried out by 59 undergraduate students assessing the websites for usability by completing a usability checklist (Gaffney 1998). An independent assessment was also carried out by the author looking at content. As a result of these initial studies the websites were cut in number to 19. The reasons being a lack of content, that not all were completely relevant to the study and several were merely repeating similar information from other websites. The 6 websites that have not been taken forward are indicated in Figure 4 marked in grey italic.

The websites have also been broken down into three target audience categories, although these do overlap: design targeted websites (with some aspects for business and general use), primarily business targeted websites, and design and education targeted websites.
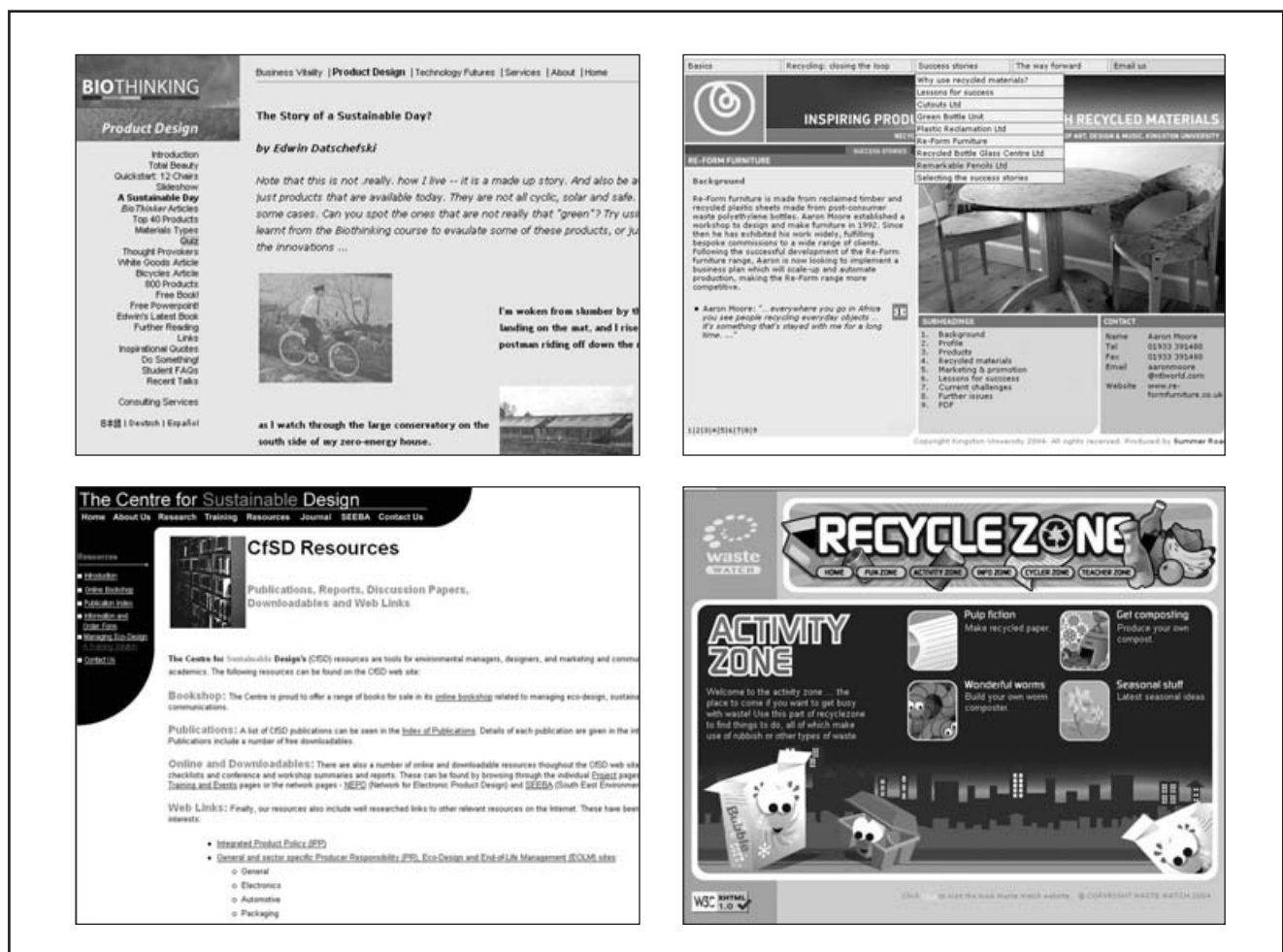

Figure 3: Sustainable design website examples: Biothinking, the Centre for Sustainable Design, Inspire Recycle, and the Recycle Zone

Primarily DESIGN targeted websites with some aspects for business and general use	
Website name	**URL**
Biothinker	www.biothinking.com
Earth from Above	http://home.fujifilm.com/efa/mm/
Barking Crickets	http://eco.barkingcrickets.org
O2 Network	www.o2.org
Conservation Economy	www.conservationeconomy.net
Forum for the Future	www.forumforthefuture.org.uk
Yann Arthus Bertrand	*www.yannarthusbertrand.com*
Ecosustainable Hub	*www.o2.org*

Primarily BUSINESS targeted websites	
Website name	**URL**
PRe	www.pre.nl
RMIT Centre for Design	www.cfd.rmit.edu.au
Inspire Recycle	www.inspirerecycle.org
Rocky Mountain Institute	www.rmi.org
Clean Production Action	www.cleanproduction.org
SustainAbility	www.sustainability.com
International Institute for Sustainable Development	www.iisd.org
IDSA	*www.idsa.org*

Primarily DESIGN and EDUCATION targeted websites	
Website name	**URL**
Information/Inspiration	www.informationinspiration.org.uk
Sustainable Design Award	www.sda-uk.org
Demi	www.demi.org.uk
Centre for Sustainable Design	www.cfsd.org.uk
Centre for Alternative Technology	www.cat.org.uk
Redefining Progress	www.rprogress.org
Ecological Footprint	*www.myfootprint.org*
Design for Environment	*http://dfe-sce.nrc-cnrc.gc.ca*
RecycleZone	*www.recyclezone.org.uk*

Figure 4: Table of reviewed websites

The websites have been assessed by the author comparing each point on the 12 features model to the content covered on the websites. Each point was then given a rating from 1-5. A rating of 1 would mean no content was present on this area. At the other end of the scale a rating of 5 would mean the content was comprehensive on the area. Figure 5 shows the resulting spider diagram for each website.
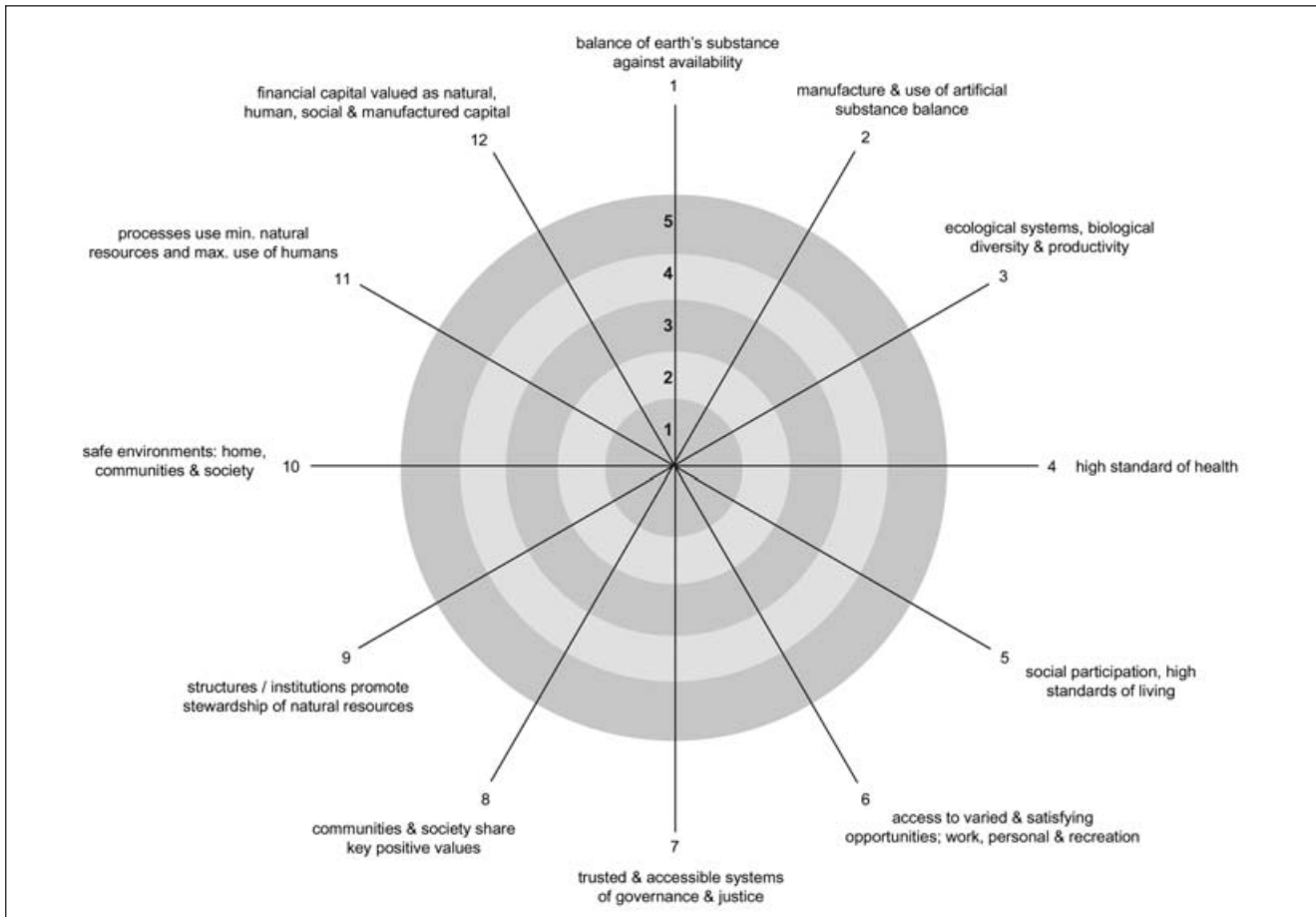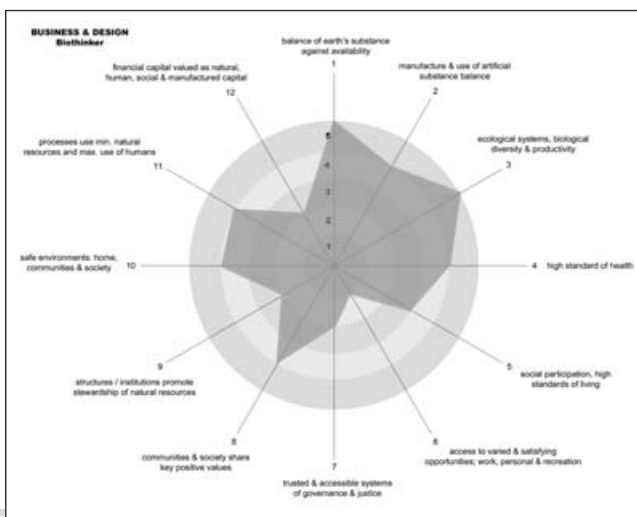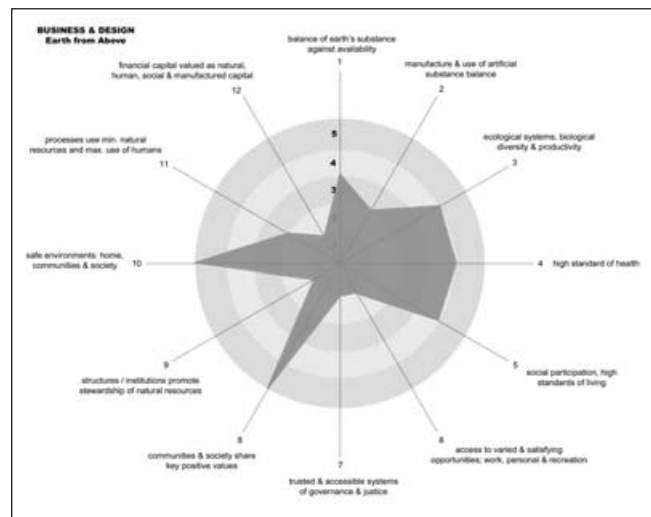

Figure 5: Sustainable design websites content webs based on the 12 features model (Johnson 2003)
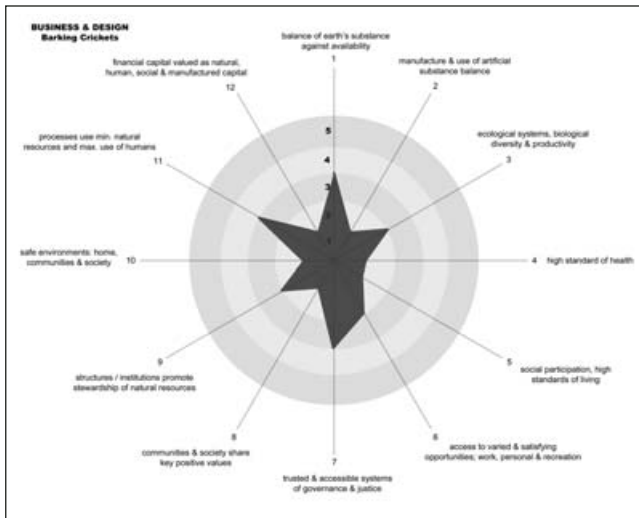
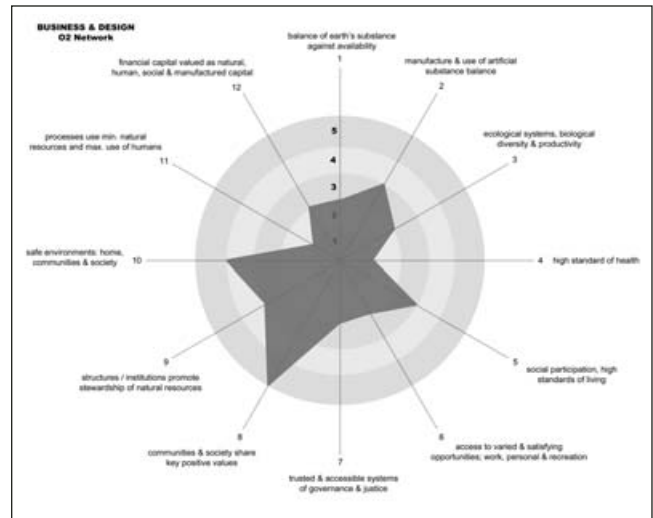## Primarily DESIGN targeted websites with some aspects for business and general use
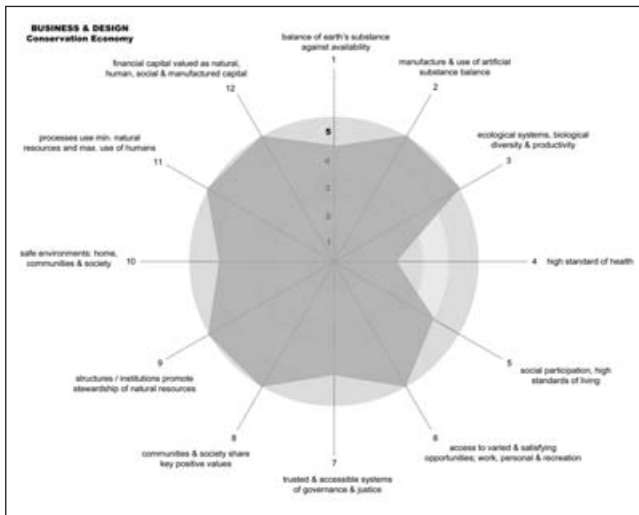

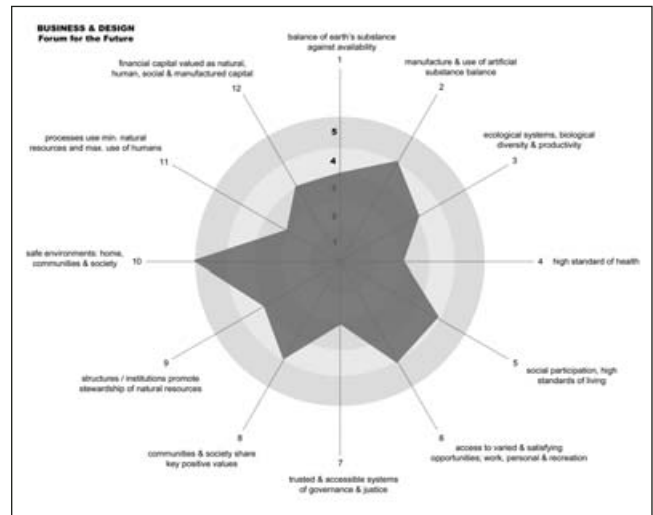*Biothinker*

Earth from Above
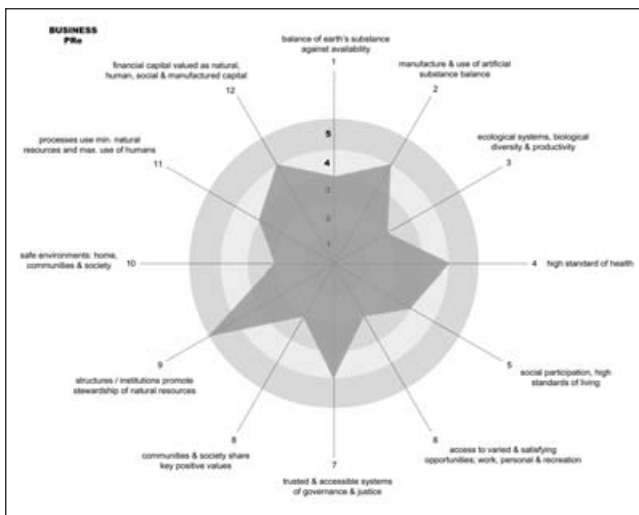
Barking Crickets

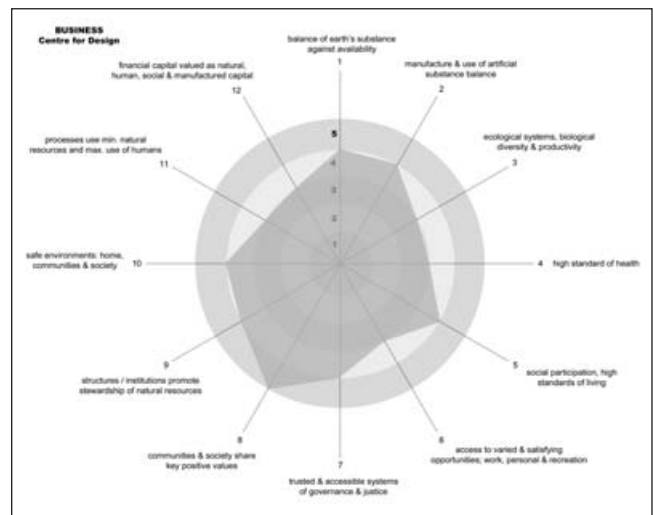
O2 Network

Conservation Economy

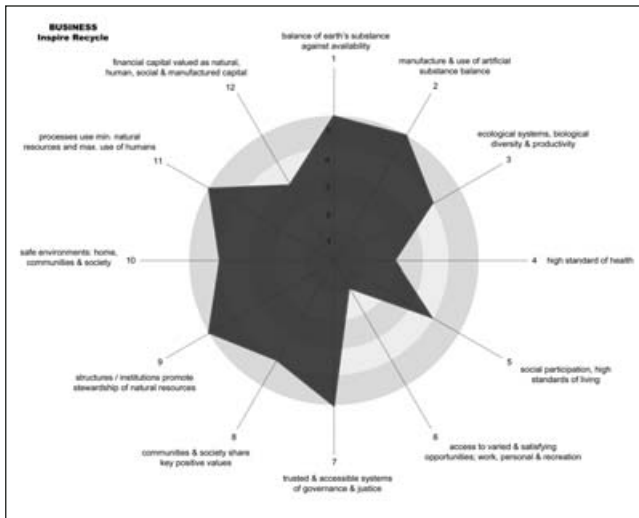*Forum for the Future*

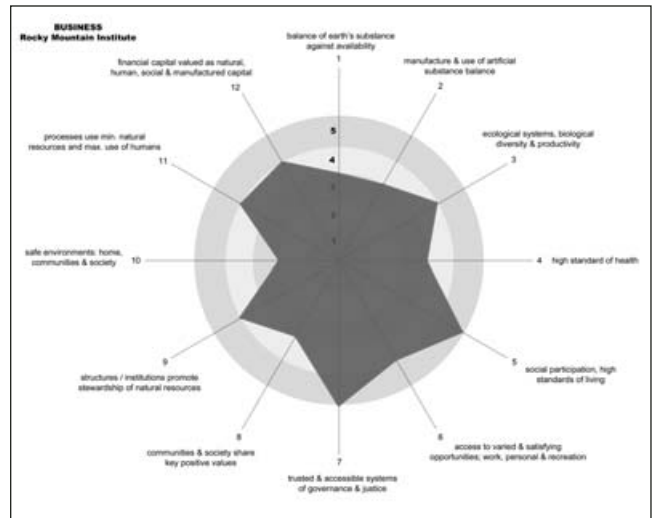## Primarily BUSINESS targeted websites

PRe

RMIT Centre for Design
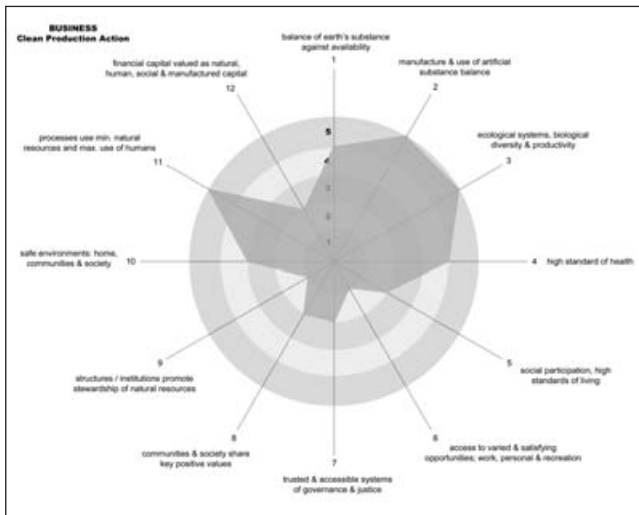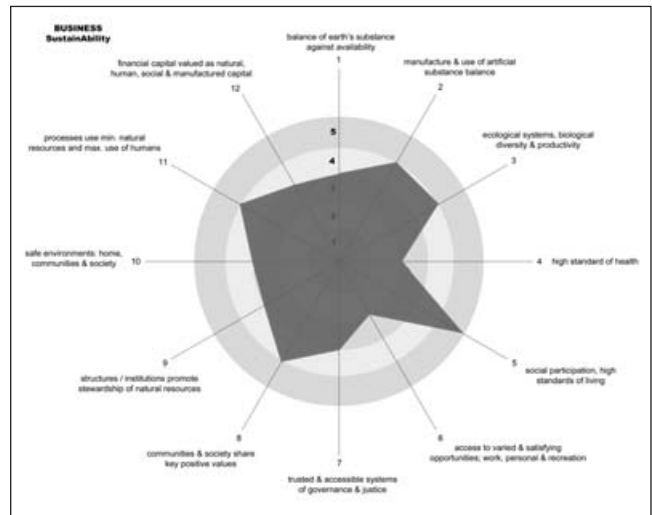
Inspire Recycle

Rocky Mountain Institute

Clean Production Action

SustainAbility

International Institute for Sustainable Development

Each of the 12 features has been placed on a spoke on the web diagram, with the websites plotted on this according to their 1-5 ratings (Figure 5). 1 is situated in the middle of the web with 5 being the outer ring.

Primarily DESIGN and EDUCATION targeted websites

Information/Inspiration

Sustainable Design Award

Demi

Centre for Sustainable Design

Centre for Alternative Technology

Redefining Progress

The spider diagrams are useful in displaying the content of the site visually and they have proved a useful tool in selecting the specific websites to look at. For example, the Barking Crickets website is shown as having little content on the majority of sustainability sections compared to Conservation Economy which scores highly on most of the 12 features.

What is effectiveness?

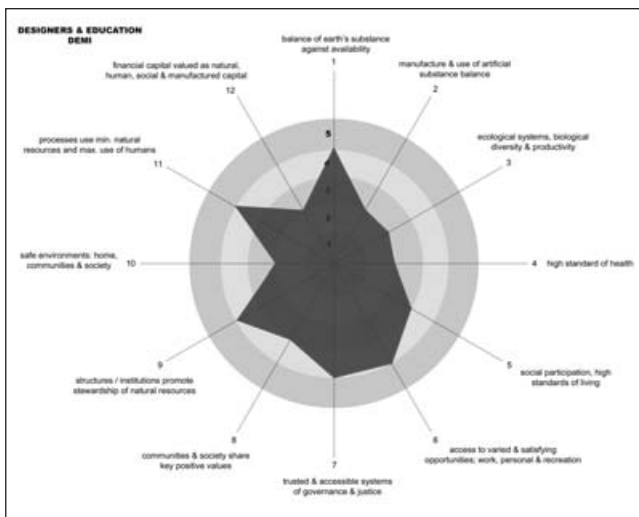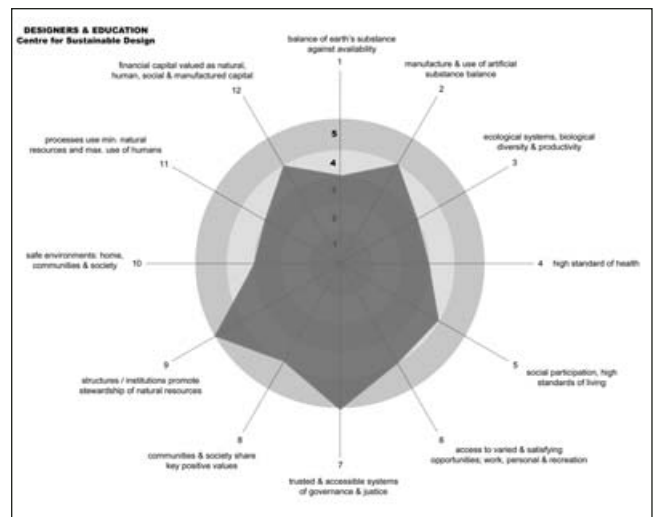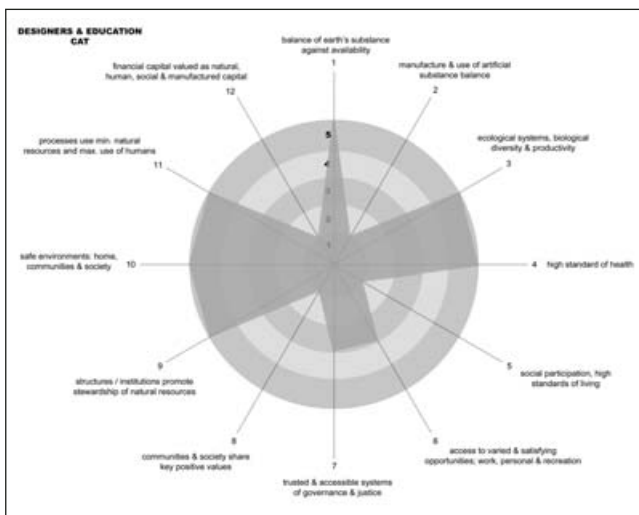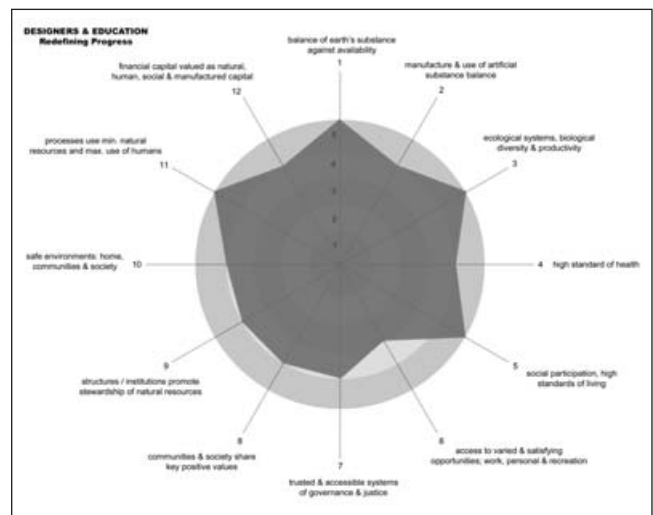The focus of the research project will be to assess how effective sustainable design websites have been in conveying and communicating information, often to an audience who struggle to place a high priority on these issues.

How can effectiveness be judged? Is it judged by a designer gaining an understanding of the relevant issues or an attempt by the designer to resolve these issues? Or is it that a demonstration of effective sustainable design practice is the criterion for success? The word 'effectiveness' can be extremely broad, for example a website may be considered effective by simply getting a user to access the site, or return to it. It may also be judged on how much influence it has on the user.

In this instance website effectiveness covers a range of areas from content to usability. Initial research studies into usability and effectiveness have proved useful in establishing a firm understanding of the key areas.

These areas include:

- **cognitive psychology** (visual perception, information processing, attention, memory, learning, models);
- **human-computer interaction** (physical, psychological, experience, socio-cultural);
- **usability** (navigation, learnability, accessibility, feedback, satisfaction, efficiency, memorability, errors, throughput, flexibility, attitude);
- **professional writing** (comprehension of functions, value of information and inspiration, wording, community issues, users, influence, competency);
- **linguistics** (sections, choice, theme, headings, chunking, structure, cohesion, lexical density);
- **rhetoric** (persuasive value (visual style, interaction impact, written style, aesthetics, narrative, image use) style, architecture, shell sites, content (purpose, use of text, direct, consistency, contacts, FAQs, communication statement, obvious links, clarity, initial impression)).

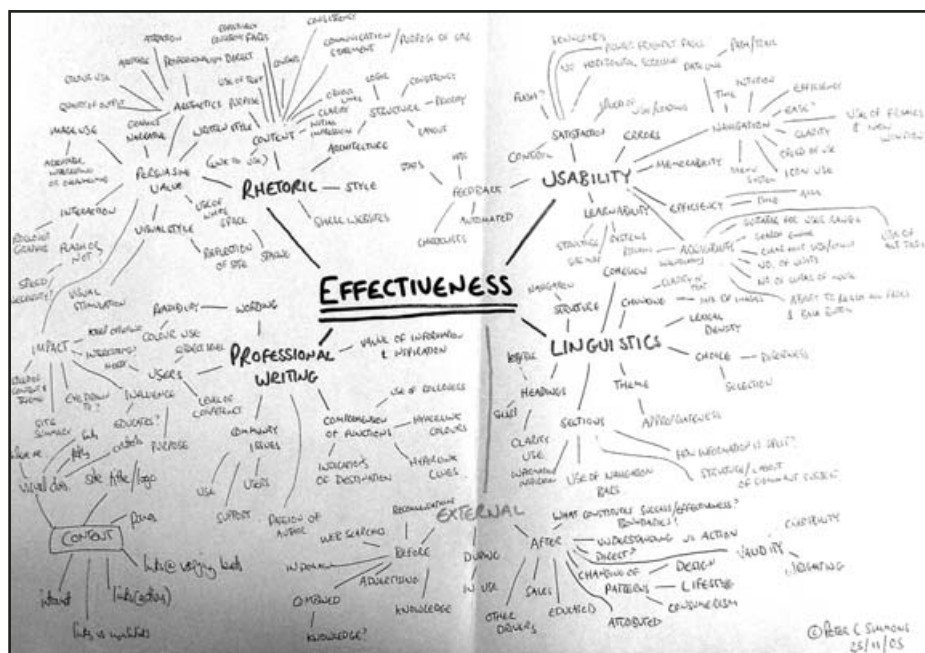(Durham 1999, Nielsen 1993, Mayhew 1999, Preece 1993)

Figure 6: A brainstorm based on effectiveness as discussed by Durham 1999, Nielsen 1993, Mayhew 1999 and Preece 1993

The brainstorm in Figure 6 shows the key areas of effectiveness as loosely based on texts by Durham, Nielsen, Mayhew and Preece. It illustrates the wide-ranging areas that make up effectiveness in this context.

These effectiveness ideas identified could all be categorised under the actions of the user before, during and after use. Most users fall into the category of surfer or information retriever. Both will often access the same websites and same information but will be looking for different things.

Before reaching the website several possible paths may lead you to the site. A revisit to a website may indicate that the site has been successful. Although a revisit may be viewed as a failure, as the user may not have been successful using the website the first time. Recommendations from colleagues or leaders in the field may be considered as a success measure of effectiveness, as it has proved useful enough for the recommender. Advertising and its ability to lead you to a website plays a key role, once again it comes down to what is success? Website searches to reach the required site may indicate a level of success in terms of popularity but even that can be bought. The other possibility is that the website was discovered by pure chance, this may indicate the appropriateness of a domain name rather than helping establish its effectiveness.

During use is a huge area of effectiveness, it covers usability, rhetoric, professional writing, linguistics, cognitive psychology and human-computer interaction all shown in Figure 6.

After use, there are several effectiveness measures such as a change in patterns of design, lifestyle or consumption. After use, considers a review of a websites' usability, its validity, credibility and weighting, all of which could be judged upon user decisions that follow. A reflection of success could also relate to website sales and a users' education. Boundaries remain hazy as to the issue of understanding versus actions, e.g. design decisions in demonstrating the effectiveness of a website, and, furthermore how they relate to it.

The important area that this study addresses will be in the area of effectiveness of websites in sustainable design decisions. In this instance, effectiveness would constitute a design decision being taken or affected on the basis of interaction with website and the resulting information or inspiration.

An increased computer competency and accessibility of the web has led to an influx of websites on this subject, but how does the user know which website is giving credible information and another not? This is an issue which is difficult to address and most would advise going with recognised leaders in the field as trusted sources. But can this be measured? There are also often contradictory messages depending on what you're wishing to achieve i.e. is it better sustainably to create a kettle that can easily be disassembled and some parts recycled, or one that lasts for a long time period and doesn't need constant attention?

Conclusions

Now that issues of effectiveness have been raised (Figure 6), the study aims to look further at the effectiveness of these websites before, during and after use. The study will be evidence-based with a hypotheses emerging from the evidence (grounded theories).

Figure 7 shows proposed further studies to be carried out, in order to gain a comprehensive review of the effectiveness of the websites and their role in design decision making.

Further studies		
Before	**Research task**	**Aims and objectives**
	• Interviews with designers, students and teachers, could be used in collaboration with questionnaires.	• To establish how they know about a certain website, the influence of advertising and power of the search engine. • To also establish their knowledge of the internet and experience in sustainable design, and any influence that may have had.
	• Observational studies of design work.	• To see how and at which points in designing the internet as a tool has been used. • To analysis the content of the websites.
During	**Research task**	**Aims and objectives**
	• Observational studies during computer interaction.	• To record in real-time how users interact with websites, recording errors and difficulties with the websites whilst completing tasks and just surfing.
	• Hypothesis testing and cluster analysis statistical study, based on feedback forms… paper-based and electronic.	• To gather statistical analysis of the feedback to support discovered theories and help to establish website comparisons.
After	**Research task**	**Aims and objectives**
	• Logging use/tracking analysis using website statistics.	• To gather information and data on website access, highly used features, errors committed, exit pages, and time spent on the website.
	• Questionnaires and feedback on the websites after use.	• To gain invaluable primary feedback on the websites from users and where possible the website author. • To gather further feedback from progressing the Sustainable Design Award website throughout the study.
	• Analysing appropriate projects and folios of design work.	• To seek patterns of where website input has proved useful throughout their design work, and how it has been used.

Figure 7: further studies based on website effectiveness before, during and after use

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