Giving Value to Waste

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Abstract
In order to achieve sustainability within the design industry, designers and educators working within changing value systems need to develop practical and contextualised solutions.
This paper examines ecological principles based on growing environmental awareness and the need to imbue responsibility towards our environment and relate appropriate technology. Although the issues surrounding 'green' or 'ecologically friendly' designs are many and varied, the choice and use of suitable materials can play a major role in achieving sustainable design. In order to demonstrate how ecological principles can manifest themselves in the development of sustainable practices and products, I will discuss the process that I implemented for the design and manufacture of furniture items made from post-consumer waste.

Addressing Environmental Issues through Design Education.

Our role as design educators
As design educators it is our duty to embrace and disseminate information relating to the changing value systems on the horizon of our relative design industries. We need to promote sustainability within the design industry by teaching decision-making systems that allow for optimum solutions from within our own specific circumstances and embrace our social and environmental responsibility.

Victor Papanek (1995:17) suggests "We must examine what each of us can contribute from our own specific role in society"...., and ask ourselves, "What is the impact of my work on the environment?"

The educational delivery
To facilitate the inclusion of Environmental and Sustainable content into our teaching methodologies I would like to use the opportunity of this workshop obtain input on the following issues;

- What degree of importance should be placed on the inclusion of sustainable practices into our teaching methodologies and the curricula that we offer?

- Should existing global ecological theories be uniformly applied to design teaching or should we consider more specific, regional approaches based on available resources, social and economic situation?

- Is our current evaluation system flexible enough to adopt changing value systems and could this possibly create conflict with design industry requirements?

- To what extent can the practical application of re-use or recycling concepts feasibly contribute towards making design more sustainable?

- Which research structure could best assist in achieving sustainability within the built environment?

Traditional Vs .Sustainable Criteria

Charles Kibert (1997:202) traces the origins of sustainability back to an initial recognition of the fact that environmental problems impact not only on the quality of life but also on our economic systems. The present notion of sustainability was described in the 1987 Brundtland Report as "leaving sufficient resources for future generations to have a quality of life similar to ours". An environmental movement orientated toward sustainability emerged about this time and began affecting all segments of society and commerce, including, albeit slowly, the construction industries and its allies.

For the construction industry the two classic sustainability criteria, minimizing resource depletion and preventing environmental degradation, are used to define sustainable construction. A third criterion connected to providing a healthy, safe and accessible working and living environment has been added to directly connect the human occupant to environmental choices.

This last criterion directly impacts on the interior design industry (possibly more so than on other design disciplines). As interior designers and design educators we can no longer dodge our responsibilities towards sustainability within our disciplines and need to become more accountable for the transference of the appropriate information.

Traditional and sustainability criteria for building materials, products and systems.

Traditional Criteria	Sustainable Criteria
Performance	Resource conservation
Quality	Environmental preservation
Cost	Creating healthy environments

(Kibert 1997:202)

Changing value systems

Criteria used when evaluating our learners' success and their ability to solve problems creatively must change in order to reflect a shift in value systems, even in the absence of established and reliable methods of measuring sustainability. As Papanek (1995:7) says " All design is goal-related play. Only our questions change. We no longer ask, 'How does it look?' or "How does it work?' We are more interested now in the answer to, 'How does it relate?"

Existing Environmental Principles and Ecological Theories

Creating the built environment with environmental awareness and sensitivity would be the outcome of applying various principles of which I have included the following two:

The Principles of Sustainable Construction
Extracted from: *Environmental cost internalization for sustainable construction.*
By Charles J.Kirbert (1997:204)

1. Minimize resource consumption.
2. Maximise resource reuse.
3. Use renewable or recyclable resources.
4. Protect the natural environment.
5. Create a healthy, non-toxic environment.
6. Apply Life Cycle Cost Analysis and True Costs.
7. Pursue quality in creating the built environment.

The Hanover Principles
Extracted from a compilation of ecological guidelines developed by noted environmentalist and architect William McDonough (1992).

1. Insist on the right of nature and humanity to co-exist.
2. Recognise interdependence.
3. Respect relationships between spirit and matter.
4. Accept responsibility for the consequence of design.
5. Create safe objects of long-term value.
6. Eliminate the concept of waste.
7. Rely on natural energy flows.
8. Understand the limitations of design.
9. Seek constant improvement by sharing knowledge.

In addition to these guide lines we should also learn to apply; '*The life cycle analysis'* and *'Environmental impact of materials'* which appear further on in this paper.

Party to the Creation of Waste?

Stylistic obsolescence
The field of interior design is largely influenced by fashionable trends, resulting in interiors being re-designed and revamped because they are deemed no longer stylistically contemporary, purely because the aesthetic has becomes obsolete. This stylistic obsolescence overrides the fact that the physical structures may still be sound and functional. This trend is noticeably evident in retail design with the life span of a typical department store hardly exceeding 5 years. Seldom is much value placed on the now aesthetically defunct content of the interior.

In order to reconcile the role of the interior design industry and client requirements (in the context of a capitalist driven society) with environmental issues, more emphasis needs to be placed on the recyclable content of interiors and associated products that are designed for these purposes. Instruction and criticism of design at an academic level can also contribute to this reconciliation.

The next paragraph deals with the possible avenues or options available to contribute towards the recycling process.

The Recycling Option
The concept of recycling (as simple as it may sound) is not always as feasible. The task is made more complex because of the need for establishing recovery programs, the need to sort different types of materials to avoid contamination, and a lack of consistent supply. These aspects can all contribute to making this exercise costly and time consuming, with the result that the use of recycled materials does not necessarily equal a large cost saving.
These problems are enhanced in the absence of effective waste management systems.

Forms Of Recycling

Re-use
Furniture and fitting salvaged from defunct buildings and interiors can be rejuvenated and re-used. The industry of used building materials and office furniture is well established but is hindered by the fact that these items were initially discarded because of their stylistic obsolescence and carry a connotation of being 2nd hand, unless imbued with some intrinsic or collectable value.

Re-fabrication
Components of discarded fixtures, fittings and certain building materials can be re-incorporated into the design process. This can prove time consuming and more restrictive than working with virgin materials. Re-fabrication is usually only suitable for small installations or one-off type solutions but unsuitable for mass production.

Fabrication with recycled materials
This option should prove the most adaptable and feasible way of integrating with existing design processes. If correctly recycled these materials should perform as well as virgin material. The added bonus is that these materials lose all recognisable connotations to their source and can therefore be considered as being new material. This form of recycling we could term ***non-recognisable recycling*** as opposed to the two previously mentioned as ***recognisable recycling.***

The scope of recycled materials produced for fabrication purposes is highly underdeveloped in our country compared to the United States (for example). This is evident from the variety of available products (Eco chic. 1999:30-32) catalogued as ‘Green Resources’. This field must to be developed and it is here where we as designers and specifiers should use our influence to place demands on manufacturers to produce ‘green materials’.

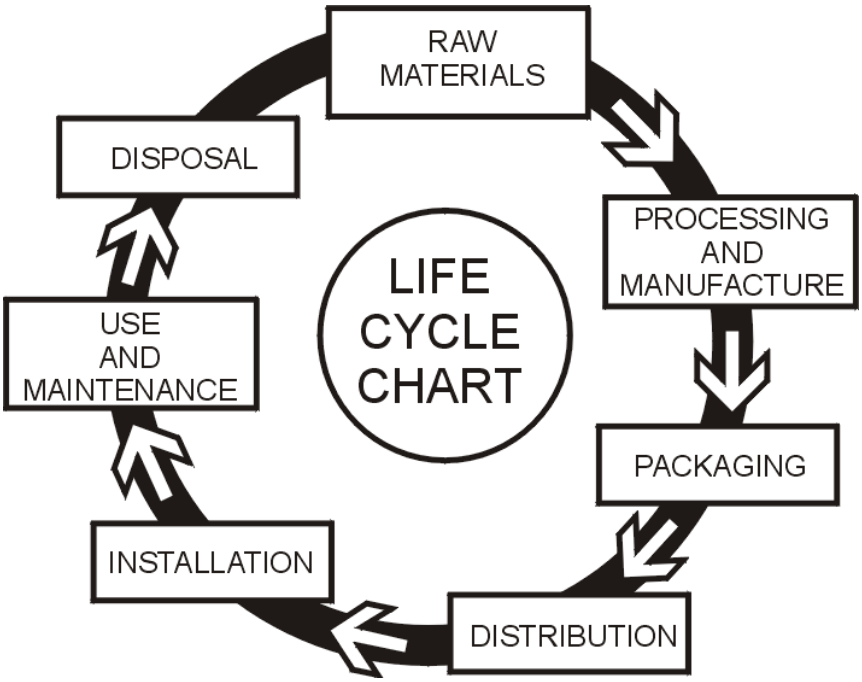
The Choice Of Material And It’s Environmental Impact.
When the choice of materials becomes the prominent concern in the development of a product, an appropriate starting point, which may require a reversal of the normal design process, should be to initially apply the ‘life cycle analysis’ and ‘the environmental impact study’ (which follows below) in order to identify materials with minimum environmental impact, and then determine their design possibilities.

Assessing environmental impact
In order to assess a material or a product’s environmental impact, the following questions should be asked;

- Is the source of the raw material renewable, non-renewable, depleted or sustainably managed?
- Does the acquisition of the raw material impact negatively on the environment?
- Are the production processes polluting water, air or soil, or affecting the environment in any other negative way (i.e. upsetting the environmental balance).
- How much waste is produced during the manufacturing processes?
- How toxic are the by-products and waste from the manufacturing process?
- How far does the material/product have to travel before it reaches its final destination?
- What are the packaging requirements and what toll on the environment do they cause?
- How much refinishing, dry cleaning, shampooing and other maintenance materials will be used over the material or product's life and how do they influence the indoor air quality and in turn the general environment?
- What is the replacement cycle?
- What proportion of the material is likely to become waste; is it toxic, and what can be done with it?
- Is the production, installation, or use of the material or product in any way compromising the health or safety of the people involved?
- How much energy is required at every step of the material or product's life as listed above?

Platowicz, G. (1995:96)

Life Cycle Analysis of Materials And Products



NB: Each stage of the cycle requires a certain amount of energy and produces a certain amount of waste. Transport of material or product is usually required between each stage of the cycle.

Fig.1 Life cycle analysis chart. Platowicz, G. (1995:96)

My Project

Contextualising

In addition to the previously mentioned and established global environmental principles, I have identified a few more criteria, which usefully relate to my particular context (Johannesburg, South Africa, 2001) although, I believe that they have a wider relevance especially in other so-called 'developing' nations. These principles I have applied to my own work. They are:

- A sensible use of available resources.
- Accessible technology.
- Small business development and job creation.
- The spirit of craftsmanship and skills development.
- Ease of disassembly in order to facilitate re-use or recycling.
- Reduction of waste generated by stylistic obsolescence.

Putting theory into practice

In an attempt to show how theory can be put into practice, I will discuss the process I implemented in the design and manufacture of items of furniture made from post-consumer waste.

Choice of material

A material caught my attention because of its ability to completely comply with the 'life cycle analysis'. It also proved that if correctly handled, it would have very little environmental impact. Surprisingly, this material is a form of thermoplastic. The material is made from post-consumer waste and produced through a method of co-mingling different plastics. By its nature the material is badly contaminated, supplied in a limited colours and has inconsistent properties. Also, and in my opinion most unfortunately, it is marketed as 'Timber Plastic' and is used as an inferior alternative to timber, which has led to a limited application and under-development of this material.

Plastic as a sustainable material

The ability of a thermoplastic polymer to be repeatedly recycled, the fact that it requires no maintenance, is non-biodegradable and has low energy requirements needed for processing and handling (Wessling 1990:6), is the key to its success as a sustainable resource. These properties should be perceived as positive aspects and need to be exploited further. Even if no more new plastic or plastic products were to be manufactured from this day forward, what is to become of the abundance of this material that already exists? Even if no more virgin plastic was produced we are already confronted with enormous quantities that are not going to biodegrade in our lifetime. Any reduction in the production of new plastics seems highly unlikely with the multitude of new products, including electronic and computerized items that are snugly housed in plastic casings.

The Development of Timber Plastic

Pearson(1933:14.18) describes the co-mingling process as follows; When it is difficult or too expensive to separate generic plastic materials for recycling purposes, it is possible to deal with a co-mingled mixture of all the polymers from the waste stream. Contrary to historical perceptions, those materials, which are incompatible with each other, can be processed in a variety of ways to overcome the negative properties derived from their incompatibility.

The crudest application of this technology is in the form of co-mingled, extruded, or compression-moulded profiles, which have found a new market applications in landscape timbers, park benches and so forth. Here a commingled mixture, un-cleaned and containing scrap metal and paper, can be fabricated into useful products.

This technology is moving toward the second generation, where the co-mingled mixture is "refined". That is, the metals and other debris are removed whereupon the materials can be thoroughly mixed and melt-filtered. These materials are then suitable for use in conventional moulding equipment.

The material that I have chosen to experiment with and which is locally available (although production is still relatively small) falls very much in between these two previously mentioned categories. Hopefully with greater demands, larger production and improved grades will become available.

Although the material is being utilized, I feel its current applications are limited through its association with timber. I have exploited the materials 'plastic' properties by devising a cost-effective method to heat and form the material into shape rather than applying conventional timber construction techniques. The ability to easily form the material should improve and expand its design capability and liberate it from its restrictive association to timber.

In Conclusion

Reality check

- Waste and pollution are damaging our environment.
- Financial costs take preference to social and environmental costs.
- The planet does not have unlimited resources.

Embracing reality

Reality is also the fact that we as designers and design educators must become proactive towards achieving sustainability within our industry. As long as all the theory simply remains that, we are not going to achieve tangible outcomes. An intense effort to transfer the theory into practice must become a priority. We must: use design as a foundation in attempting to redirect society's wasteful habits, take up environmental causes with enthusiasm and see them as a challenge to our creative impulse.

New principles and changing value systems require new and holistic approaches to design. It is unlikely that any one new process or principle will comfortably dovetail into existing systems, resulting in the fact that practicing designers spend little time or money on experimentation in such a highly competitive field.

The introduction of new processes or techniques will generate problems that have to be resolved and need to be tried and tested. Design institutions in conjunction with materials manufacturers, fabricators and recyclers should work together to achieve solutions to these problems.

Applied research must become the testing ground to determine possibilities and limitations of sustainable technology. Fortunately as educators and researchers we are in the position where our success or failure is not purely determined by capital gain. Knowledge is our commodity.

Embracing innovation
The use of 'new' materials requires a change in perception and application. We can refer to the example of Marcel Breuer's tubular steel chair, designed and made from a material intended for bicycle fabrication, to understand how a change in recognition leads to new design solutions, aesthetics and principles.(Julier 1993:42,191). In fact new types of materials require new approaches and should not only be seen as a substitute for the 'real' thing.

Education Rather Than Legislation.

Due to the complexity of the environmental issues, which differ greatly from region to region, no set of fixed rules or regulations can always prescribe the optimum solutions.
Kibert, (1997:201) when summing up the formulation for sustainable decision making says that in the absence of robust decision systems and methodologies "the sole remaining guidelines are and should be intuitive".

Without any legislation in our country enforcing the implementation of forms of sustainable design, knowledge and awareness through education may prove to be the only effective way of counter-acting environmental abuse.

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