
Transdisciplinary dimensions of sustainable design practice

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Biographical notes: Aleksandar Subic is the Head of School of Aerospace, Mechanical and Manufacturing Engineering at RMIT University in Melbourne, Australia, Editor-in-Chief of the *International Journal of Sustainable Design* and member of the Editorial Board of the *International Journal of Vehicle Design*. He is currently the Director of the SAE-A and Education Director of the Corporate Research Centre for Advanced Automotive Technologies. He is internationally acknowledged for his work in sustainable engineering design and technology innovation, including sports and automotive technology domains. He has published over 200 international peer reviewed journal articles, book chapters and papers to date and has undertaken significant number of high impact research projects in collaboration with industry world wide resulting in novel products and system solutions.

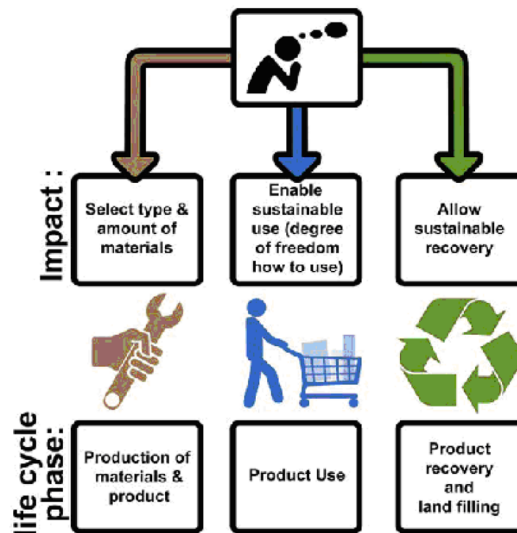
The breath and depth of papers featured in this second issue of the *International Journal of Sustainable Design* highlight the many dimensions of the sustainable design practice. Contributors to this issue have tackled the complexities associated with the design and development of sustainable products using a wide range of methods and approaches. Their work has uncovered new research questions that can be addressed only through different kind of thinking that focuses on the whole system and draws on the enabling knowledge across a range of disciplines. This is the message the journal has reinforced in each issue.

There is an ever increasing need to develop, produce and operate products and systems that are robust, reliable and of high quality, supportable, cost-effective and environmentally sustainable from a total life-cycle perspective, and that are able to respond to the needs of the user/customer, industry and society in a more sustainable manner. Our understanding of sustainability and of sustainable design is constantly evolving through practice.

There are different definitions of sustainability recorded in literature, with up to eight or more dimensions of sustainability identified to date, including: physical, environmental, economic, social, equity, cultural, psychological, ethical, etc. In this issue, Walker further extends this portfolio of considerations in relation to sustainability by introducing spirituality and its effects on the physical design and functional attributes of artefacts/products. Despite the wide range of factors considered, it is widely accepted today that sustainability encompasses three main domains (social, economic, environmental). Also, it is generally agreed that sustainable development represents

development that meets the needs of the present without compromising the ability of future generations to meet their needs. This in turn means that sustainable design is design that follows not only function and aesthetic aspects but also meets the needs of the present without compromising the ability of future generations to meet their needs. With the increases in the number, variety and complexity of products traded globally and affecting more stakeholders, sustainable design has gained increased importance. Even when products are reasonable produced, inappropriate use and disposal can have negative impacts. Life cycle of products is typically related to raw material extraction, production, use and end-of-life, whereby design impacts all life cycle phases (Figure 1). Lin et al., and Hanson and Hitchcock propose in their papers featured in this issue a range of sustainable design methods that aim to reduce the environmental impacts of products in particular through better understanding of material and resource options and implications.

Figure 1 Impact of design on product life cycle (see online version for colours)



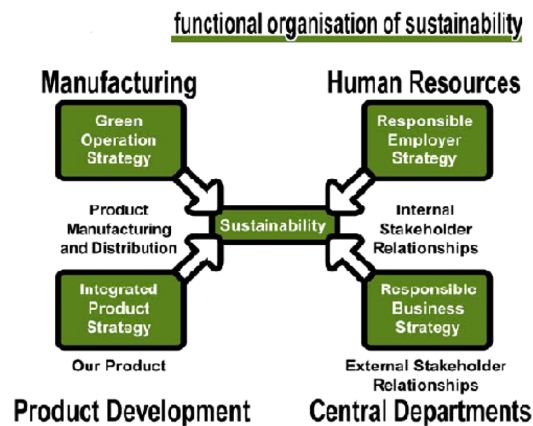
Effective development and application of sustainable design practices relies not only on the individual designer but rather on the culture and capability of the enterprise/organisation. Integration of sustainability strategies must be based on a comprehensive analysis of the attributes of the particular enterprise/organisation, including:

- key aspects of product and processes from a sustainability perspective (hot spot analysis)
- flexibility of design and processes (degrees of design and manufacturing freedom)
- available resources (time, employees – number, type, knowledge – capital)
- how decisions are taken and organisations are working
- available data
- SWOT analysis benchmarking market competitors and consumers.

It is essential that the organisational structure reflects the business approach to facilitating sustainability. A typical functional organisational structure of sustainability in an industry setting is shown in Figure 2.

Burvill et al., in their paper titled ‘Evaluation of operational environmental performance: an engineering approach’, investigate the enterprise/organisation issues associated with sustainability and in particular in regard to environmental performance. They propose a novel risk evaluation framework to overcome some of the identified issues in an industry setting. For this purpose, the authors describe a range of concrete methods and actions that can be undertaken by different stakeholders within the organisation.

Figure 2 Example of functional organisation of sustainability in an industry setting (see online version for colours)



People (users, consumers) are central to sustainable design, whether the focus is on products or the physical environment that people are exposed to (housing, public spaces). This issue features two papers that reinforce this statement and provide an in-depth treatment of this subject matter with designated interrelationships between relevant stakeholders. For example, Maria La Gennusa et al., in their paper titled ‘People comfort and artwork saving in museums: comparing indoor requisites’, discuss in detail the indoor environmental conditions in museums to preserve exhibited artworks but also to ensure the comfort of visitors. Authors propose technical guidelines that have the potential to meet both requirements. Furthermore, Freney in his paper titled ‘Earthships: sustainable housing alternative’, critiques an obscure form of sustainable architecture that addresses many of the environmental, social and economic challenges facing humanity. He describes particular designs of architect Michael Reynolds, that integrate passive heating and cooling, food production, water catchments, renewable energy, solar hot water, grey-water recycling and sewage treatment, which he calls “Earthships – independent vessels – to sail on the seas of tomorrow”.

The papers featured in this issue reflect the breadth and depth of topics covered by the *International Journal of Sustainable Design*. They bring together thinking and research from a wide range of disciplines that provide greater insight into the different dimensions of the sustainable design practice.