Sustainable Innovation and Design:

Future Implications and Lessons Learnt from the Last 20 Years

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Twenty Years on from 'The Earth Summit'

'The Earth Summit' in Rio de Janeiro in Brazil in 1992 was a landmark event with the launch of Agenda 21 (United Nations, 1992) – an action plan for sustainable development - but there was little high level debate over climate change, resource efficiency or innovation. However, over the last 15 years, there has been increasing global discussion and consensus amongst scientists and other stakeholders over the existence and impact of climate change. This has led to the development of a range of mitigation strategies to reduce greenhouse gas emissions and growing activities related to pre-emptive climate change adaption. In the last 10 years, resource productivity and efficiency, and materials security issues - particularly related to critical materials and conflict minerals - have moved up the policy and business agendas. More recently the concept of 'Circular Economy' (CE) has gained visibility and momentum, particularly in Europe, through the activities of a number of influential think-tanks, thought leaders, companies and European Commission (EC) policy-makers. At present, a the EC is working on a CE policy package announced in December 2015 and a British standard on implementing CE in organisations is in development. Following the economic meltdown in 2008, catalysing 'green growth' and 'green economy' have become an integral part of international policy agenda after the publication of influential reports by Organisation of Economic Cooperation and Development (OCED), United Nations Environment Programme (UNEP) and World Economic Forum (WEF). For example, in the late 00s South Korea passed a national green growth law and initiated the Global Green Growth Institute.

Sustainable Development Goals and New Climate Change Treaty?

Discussion on sustainable development took a back seat to change climate in the 00s. The early to mid 00s saw high visibility of climate change issues with a decline in media coverage following the global economic crisis in 2008. However, awareness has risen again with passing the United Nations Climate Change Conference (COP21) in Paris in November 2015 that reset global action on climate change. This has been heightened by positive soundings by the US, Canada and China on cutting carbon emissions. In parallel, momentum has be added following the UN's endorsement, in September 2015, of 17 global goals and 169 targets for Sustainable Development (United Nations, 2015) between 2015-2030, building on and replacing the Millennium Development Goals. Action on climate change is highlighted in Goal 13, however two other goals are particularly noteworthy in terms of sustainability, innovation and design: Goal 9 – Build*(ing)* resilient infrastructure, promot*(ing)* sustainable industrialisation and foster*(ing)* innovation; and Goal 12 – Ensur*(ing)* sustainable consumption and production patterns. However, the likely impact of these high level goals at a company, designer or entrepreneur level remains unclear.

Sustainable Consumption and Production (SCP) and Product Policy

On a global level, the United Nations (UN) Ten-Year-Programme on Sustainable Consumption and Production (SCP) emerged from the UN Rio+ 20 Summit in 2012 building on the Marrakech Process launched in 2003. In the 00s, SCP became an integral component of a number of national Sustainable Development strategies. The decade saw a shift in the SCP debate away from an emphasis on supply-side issues of (cleaner) production towards more

demand-side issues related to sustainability, lifestyles, consumption and products. Behind the scenes in the decade since 'The Earth Summit', the international product policy agenda evolved and developed. The concept of Integrated Product Policy (IPP) – a strategic approach to *green* demand and supply side policy tools (Charter, 2001) – emerged from the EC in the late 90s which then morphed into the EC SCP Action Plan in the late 00s (European Commission, 2008). Outside of Europe, Japan developed a similar approach to IPP designed to drive Japanese competitiveness through *greener* product development. After incubation in the 90s, 'producer responsibility' legislation was implemented in early to mid 00s in the European and Japanese electronics and automotive sectors, with a focus on take-back and "end of life" management. However, the mid to late 00s saw product policy move away from a focus on the "end of life" towards approaches aimed at reducing environmental impacts throughout the product's lifecycle with an increased recognition of the role of design at the "front of the pipe". For example, research in the early 00s reinforced the relative importance of different environmental aspects and lifecycle phases associated with separate types of products e.g. energy consumed in the *use* phase in *active* products (VHK, 2005). It is increasingly being understood that a significant proportion of a product's environmental impacts are determined at the design stage and failure to address environmental aspects early in the process means that problematic issues may be embedded in products entering the market.

Modern Globalised Economies

There is a paradigm shift emerging as the world gets smaller and economic power moves from the North to the East and the South. Since the 90s, globalisation, supply chains and growth of information and communications technologies (ICT) has had a major impact on global consumption and production patterns. We have seen the rise of the growing middle class consumers in China and India, and now Africa. The internet has become pervasive, allowing massive real-time access to information. Social networking technologies have enabled the accelerated sharing of ideas and information, and new "open" innovation approaches are emerging that enable greater collaboration and the breaking down of traditional boundaries. Modern economies have become a complex mix of product and services, and product-service combinations and the infrastructure to deliver them. Significant research into sustainability and Product-Service-Systems (PSS) was initiated in the early 00s (Tukker et al, 2008) to reflect these shifts which then seemed then to lay fallow for the rest of the decade. Many of these issues re-emerged in 2010s under a range of headings including Green Business Models, Servicisation, Prosumption (Wikpedia, 2015a), Sharing Economy and Collaborative Consumption.

Brands, Supply Chains and Risks

Over the last decade or so, a number of mainstream players have acquired *green* brands to gain market credibility and access e.g. L'Oréal buying Body Shop International, Avis buying Zipcar, Unilever buying Ben & Jerry's and interestingly Ecover (*green* brand) buying a funkier *green* brand, Method. For many brands, *green* or not, there has been increased outsourcing of design, manufacturing and/or assembly, which has meant that addressing environmental (and social) risks related to diverse supply chains, or more accurately, networks, has become an increasingly important issue. Over the past 10 years there has been an increasing pressure placed on suppliers by major manufacturers and retailers to collect, analyse and present product-related environmental (and social) data and information for compliance purposes, and to help identify "hotspots" where improvements can be made. For many brands or products, the roles of design, development, procurement, information technology and supply chain management will need to become increasingly integrated.

Greening

From a relatively small number of *green* niche players and a few leaders in the manufacturing sector implementing eco-design in the early to mid 90s, there has been a broadening of the sectors and companies engaged in the *greening* of their products. *Greening* is happening at the design level in a number of sectors and companies often driven by increased competition. However, the extent of the *greening* is still at the level of incremental improvement or re-design,

rather than at the level of radical or systemic change. Most of the focus – where it is happening - is on *eco-design* (the integration of environmental considerations into product design and development) rather than *sustainable design* (the integration of a balanced approach to social, environmental and economic considerations into design and development), and is focused on product-related environmental compliance rather than innovation or the creation of new business models. The social component of sustainability is still largely missing from product design and development, outside of "bottom of the pyramid" and ethical product discussions. The emergence of discussion around eco-innovation has expanded the policy perspective to cover the overall innovation process of creating, developing and commercialising eco-innovative products, services and technologies (but commercialisation still remains weak particularly at the SME level). Increasingly a number of leading companies are developing their own organisational approaches to managing eco-design e.g. Philips 'six focal areas of eco-design' and measuring product-related environmental performance, technically and financially e.g. Philips Green Flagships (Stevels, 2015). Tackling the *softer* organisational issues associated with implementing product sustainability will be growing issue for those companies wanting to move from a compliance to an innovation mindset.

What's next?

Since 1995, many product-related environmental laws and standards have been passed and books, journal papers and articles written and conferences held. But where are we now? Managing product sustainability has become a much more important issue for many leading-edge companies compared to 20 years ago but there is still a long way to go. However, what will the next 20 years look like? And what threats and opportunities will emerge for product/service designers, developers and new business modellers? Economic power is shifting and we will see more East-East and South-South solutions emerging. The global challenges of climate change and resource efficiency – including water scarcity - will become more and more apparent and policy-makers and business will be increasingly forced to adapt to this change or decline. Integrated approaches that aim to produce more innovative solutions whilst reducing both the carbon and resource intensity of products, services and systems will increasingly emerge. For the proactive, this will be a spur for innovation and may lead to a shift away from a problem-focus to a solutions-mindset. There are indications that this shift is starting to emerge in some leading-edge companies. For example, Method, the *green* cleaning solutions company, used their ingenuity to co-develop packaging from polymers derived plastic marine waste rather than donating money to NGOs to highlight the problem of marine waste. A selective number of policy-makers are shifting their mindset from a focus on supporting incremental improvements through eco-design to approaches that stimulate more radical and systemic eco-innovation; however, thinking and implementation are still in their early stages. Increased inter-connectivity through ICT and social networking will facilitate and enable more open approaches to innovation through new approaches, such as, crowdsourcing coupled to new forms of co-creation and collaboration. Global urbanisation will continue and cities may increasingly start to act as catalysts for the development of sustainable solutions due to their access to people, ideas, knowledge, networks, funding but also their proximity to environmental, social and economic challenges. More graduates will emerge with knowledge of sustainability that will feed through into society and this may well increase *grassroots innovation* (Charter, 2014) motivated by a new spirit of co-creation and collaboration focused on creating, making, modifying, fixing and upcycling empowered by improved access to ideas, information, facilities and tools. All this may herald a new Industrial Renaissance (Scapolo, 2014) that combines an era of Re-industrialisation 1.0 - that is more 'prosumer' driven (Wikipedia, 2015a), decentralised, localised, circular and low carbon (Charter, 2015) - with an era of Industry 4.0 (Wikipedia, 2015b) - that focuses on the development of smarter, inter-connected, digital and knowledge–driven industrial infrastructure. Both will create a range of new series and opportunities and challenges for product, service, materials and technology developers. The world keeps changing and it will continue to do so, at perhaps an even faster and more unpredictable rate; this change will continue to drive innovation but will it be in a more sustainable direction?

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At UCA, he is also co-chair of a high level cross-university sustainability working group. Martin was the founding editor of the Journal of Sustainable Product Design, The Green Management Letter and Greener Management International (GMI) and is presently a member of the Editorial Boards of International Journals of Sustainable Engineering and Sustainable Design. Martin has been a member of international/national/regional advisory boards covering green electronics, environmental technology, sustainability reporting & sustainable innovation (e.g. for P&G and InterfaceFlor in Europe).

Sustainable Innovation 2015 'State of the Art' Sustainable Innovation & Design 20th International Conference 9th – 10th November 2015. University for the Creative Arts Epsom, Surrey, UK www.cfsd.org.uk.

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