

FLUX: Design Education in a Changing World

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Community and Social engagement.

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Bridging the epistemological divide between disciplines

A position paper based on philosophical issues around the design disciplines

Abstract

This position paper is to be considered as a working paper that focuses on the topics listed under the DEFSA FLUX conference's heading Community and Social engagement. As all the listed subheadings interrelate and speak to each other the authors find it appropriate to enter into a discussion whereby these subheadings will be juxtaposed with some broader multi-disciplinary intellectual requirements identified by the international academic community. The main thrust of this discussion is centred on the academic position that the philosophy of design could facilitate bridging the epistemological gap between a range of interrelated disciplines. Not only will the design discipline be enriched but collaborative research possibilities could be identified and opened up.

The various subheadings will be clustered together. Speaking about design for development pre-suppose that the designer will acquire sensibility about culture (the human factor). By positioning the debate within the developing world (in this case South Africa and India) the issue of indigenous knowledge systems becomes prominent. To practise design in the developing world raises concern about sustainability and pre-suppose the adoption of universal design sensibilities.

The intellectual advantage of the design theorists engaged with disciplines such as philosophy and the social sciences will form part of the discussion. The discussion deliberate on a perceived need to shift the design theoretical debate towards recognition and inclusion of current third world social issues - these inform not just the products we design but recognise the users as important collaborators in the design process. A number of new fields of research that emerged in the past century impinged upon and shaped the notions of design as a creative activity. The authors would like to demonstrate how Public Understanding of Science (PUS), as an example of such a new field, contributed to the development of indigenous technologies.

Extensive collaborative, cross-cultural research since 2000 between South Africa and India, embarked upon by the authors and a research team under the leadership of Gauhar Raza from the National Institute of Science, Technology and Development Studies (NISTADS), CSIR, New Delhi, India provides the intellectual environment to the presentation and underpins the philosophical nature of this deliberation.

Keywords: design philosophy. cross-cultural research. multi-disciplinary research methods.

Introduction

In this presentation the authors explore the thrust of the conference theme *Flux: design education in a changing world*. Special attention is given to the relation of the theme to issues associated with the

sub-theme Design Education and Community and Social engagement and the sub-topics: design for development, culture and human factors in design, IKS, sustainability and universal design. Though the sub topics could be considered to be quite diverse, the authors feel that it is possible to theorize upon their complexities and at the same time initiate a process of identifying a possible theoretical framework for design research that focuses on community and social engagement. There is some exploration of a multi-disciplinary methodological structure that could facilitate research from a multi-disciplinary perspective. The authors have been collaborating in international research since 2000¹ and past experiences and findings provide valuable insights in structuring this methodology that facilitate multi-disciplinary research. Equipped with research experience, based on realities encountered while interacting with traditional communities who still indigenous knowledge systems (IKS) in culturally rich developing countries, the authors would like to share their insight on factors of importance for collaborative design research.

Flux as main theme

The overall theme of the conference, *Flux, design education in a changing world*, evokes the Heraclitian *doctrine of flux*. In its philosophical sense *Flux* was based on the belief that everything in the universe is constantly changing.² Heraclitus (*fl.c.500BC*) left little in writing (some 100 sentences in total) but is still regarded as a master in aphoristic obscurity. Some of his most noticeable ideas stated that the abstract notion of ‘*structure*’ is omnipresent and that there is parallelism or identity of structure between operations of the mind (expressed as thought and language) and those of the reality it grasps. The structure referred to is that of ‘*unity in opposites*’. Understanding of the world is like grasping the meaning of a statement (as done through language) hence the key to understanding the nature of the world is *introspection* (Honderich, 1995: 351-352).

¹ The authors are involved with on-going collaborative research with Gauhar Raza and his team from the National Institute of Science, Technology and Development Studies (NISTADS), CSIR, India since 2000. A project based on the understanding of science among artisans in India and South Africa (2000 – 2002) was conducted between 2000 and 2002 and data was collected through surveys in both countries. A book and a number of papers were produced: Raza, G & du Plessis, H. 2002. *Science, crafts and knowledge*. Pretoria. Protea Boekhuis. Collaborated research between the author and a team of design researchers from the Department of Industrial Design, Faculty of Art, Design and Architecture (FADA) of the University of Johannesburg lead to the development of a research niche area called Design for Development which conducts product design research in South Africa and in India.

² Heraclitus used the famous allegory that one cannot step into the same river twice – Blackburn described this quite aptly by proposing that ‘*Heraclitus stands in the way of knowledge (as opposed to opinion) about the physical world, but the eternal and unchanging nature of Forms, or norms of justice and reason, makes them fitting objects for knowledge by those who are suitably prepared. From Heraclitus’s point of view this must be just a fudge, since however we hymn the eternal and unchanging nature of norms of justice and reason the human perspective on them will be as mutable as anything else, so that this mutability denies our title to knowledge, we will not find knowledge here either*’ (BLACKBURN, 2006:99).

Heraclitus saw change in everything and simultaneously considered that same change to constantly undermine/damage our confidence in understanding the world. Flux therefore suggests a *changeable perception*. This could indicate the core/central theme for designers to reflect upon during this conference. One of the most appropriate attitudes about changeability came from Von Bertalanffy's *General System Theory* that considered Flux to exemplify how: '*every whole is based upon the competition of its elements, and presupposes the 'struggle' between the parts*' (Eboussi-Boulaga in Karp & Masolo, 2000:206). Eboussi-Boulaga likened Africa's attempts at simplification and unity of cultures, religions and economies to be in a state of *flux*. Such an attempt never quite stopped unity and diversity from being simultaneously compatible and complementary. To manage diversity had its own particular requirements and constraints and Heraclitus even stated that '*conflict is generalised (integral) and justice is a brawl and that all things are produced at the moment of the brawl and of necessity*' (Eboussi-Boulaga in Karp & Masolo, 2000:206)

To provide opportunity to explore this theme at a time where '*our own age finds little problematic about scientific truth, truth about the world as it is, but is intensely bothered by truth about how things ought to be*' (Blackburn, 2006:99) is a challenge. With design occupying and juxtaposing the world of the imagination with that of reality, designers tend to be less bothered by the latter. Nietzsche (1967), for instance, considered reality to be so unutterably particular that descriptions falsify it and that unchangeable things called *substance* and *permanence* introduced universal error. Philosophers in a way serve as an example to other disciplines by striving to be responsible in making sure that their preferred understanding of the world and their classification methods on how to get to such an understanding are adequate and true to *the nature of things* (Blackburn, 2006:98).

It therefore seems fit to challenge designers to approach their own understanding of the design discipline with similar responsibility as that of the philosophers. To do so the understanding of the historical flow of design practises is firstly to be seen as intimately linked with both local and international socio-economic and political forces. In the second place the knowledge of other disciplines could provide a better understanding of design practise. Design, and more specifically product design, can not function outside the context of these political and social histories. Politics and society, as outside forces, constantly changes the inner landscape of the discipline and in subtle ways create shifts that emphasise and affect both the manufacturing of products as well as change the conceptual framework within which the design is moulded.

Design as a social issue:

During the past few years one witnessed a steady shift away from consumer-led/market-led design that used a consumerist based design vocabulary that consisted of words such as '*revamp*' and '*lifestyle*' to promote a social language for designers. (Whiteley, 1993: 7-18). One of the main preoccupations for these designers was the creation of a *desire* for products with the emphasis on the *want* of a specific product rather than on the *need* for it. This *desire* is supported by the introduction of style-conscious stores such as the Habitat lifestyle store of Terence Conran that opened in 1964

(Whiteley, 1993: 18). This *desire* caused an acceleration of product development that even led to a conference in 1990 by the Confederation of British Industry in London with the title: 'Accelerating Product Development'.

Product design was situated solidly in the hands of the big corporations such as SONY and Philips and consumer-led design relied heavily on products being primarily fashionable as the '*designer in the consumer-led age seeks the immediate and impactful which, almost inevitably, are also the transitory and the ephemeral*' (Whiteley, 1993: 34-35). With the borders between *design* and *market* thus blurred and design becoming a branch of marketing, the products became wealth indicators. This inevitably creates useless products that are absorbed into cultures to support engineered customs/habits. This is a fairly unstable situation as such customs could be fickle or even become as difficult to change as it is to change economic systems. This process of absorption gets evaluated in developing countries through models measuring sustainable development and falls outside the practical experiences and '*lifestyles*' of traditional communities. We do, in fact, find two distinct systems operating simultaneously in the developing world –the modern and the traditional.

Design as a political issue:

Design as a political issue occupies a complex and fairly inconsistent world. Nowhere is it more pronounced than when one speaks about the disparities between the developed and developing world. These two 'worlds' are part of what was identified during the Cold War period as a tripartite structure of First World (Western industrialized capitalist nations), Second World (centralized command economies in Communist countries) and Third World (new nations who were previously colonized by the First World) ideologies. These terms are used to demarcate and politicize and '*the ideological underpinnings of this asymmetric structure politicized the three groups, tainting the transfer of aid and technical assistance with propagandistic overtones*' (Margolin, 2007; 111).

The argument holds well in many sectors but let us take the example of the so-called Green Revolution when design became closely linked to the political debates that centred the issues of the Green Revolution. Ecologically responsible innovation and development of new products and the ever growing sourcing of raw materials for manufacturing were central to Green issues. Porritt (1984) spoke of the global rip-off where the developed world took far more out of developing countries (the Third World) than it added. His *Seeing Green* (1984) became one of the seminal works through which the socio-political concept of '*green design*' was introduced. The green perspective became, as a result, inevitably linked to the concept of '*sensible design*' (Whiteley, 1993: 47). With the introduction of a '*need*' and '*idea*' as central to the design process and the emergence of the '*green consumer*', design making and manufacturing shifted closer to the sciences in an effort to better understand technology and to promote awareness about consumption patterns of raw materials. The onus of saving the 'green' was to an extent shifted on the designer as well.

The political arena later developed a number of green shades. The dark greens were relatively the more hardcore activists who developed a participatory relationship with society with green activists preaching recycling to replace any new materials. On the other end of the scale there were the Buddho-Greens who rejected the use of any product except those of the utmost necessity. Porrit (1984) stated that the political problem when dealing with the future is to ensure that the interests of the individual are more in line with those of society at large and with those of the planet than with the interest of the current political rule within a country (Porrit, 1984).

Political leaders in general, and designers in specific, seldom concern themselves with production systems whereby the irresponsible use of complex materials is applied. Nothing brought this more to the international attention as the Bhopal accident that happened in India. On December 3, 1984 a Union Carbide pesticide factory spewed 27 tons of toxic methyl isocyanide gas over the sleeping population of Bhopal and more that 20,000 people died and 120,000 were disabled. This accident is still causing deaths 23 years later and is still considered to be one of the worst industrial accidents in history. The International agencies that use the developing countries as base for manufacturing toxic products shifted the responsibility of safety outside the main country. In this case the slack safety precautions around noxious chemicals endangered not only lives but caused the deaths of thousands.

Design in a developing world

Design for development is one of the key incentives for growth in developing countries. Ghose (1996) saw design in a developing country to evolve around two methodological assumptions. The first being design as ontological equipment that functioned as a fully-fledged independent discipline. The second assumption is that different cultures exhibit '*a certain identifiable common cultural substance and provide the necessary tabula rasa on which modern design may be projected*' (Ghose in Margolin, 1996; 187). This is particularly appropriate to those countries who were colonised and whose design practices were considered to be of lesser value and who were made dependent on so-called universal and a-cultural design. There exist, however, a plethora of histories, practises and even understanding of design outside these assumptions. As design is embedded in traditional cultures and supported by site-specific understanding of science and technology it is consistently sustained by local low-technology manufacturing processes. These designs survive because they are adaptable, adoptable and able to integrate innovatively with modern technologies. Therefore innovation in developing countries often leads to interesting design combinations.

When Raza (2002) stated that the lack of understanding of culture inhibits or accelerates the pace of accepting science and technology in a society and that a deeper insight into the cultural complexities of thought in society is imperative for suggesting workable solutions to socio-technical problems, he evoked the need for designers to consider IKS as a source of information. Designers in developing countries are able to engage with different cultures, resources and manufacturing processes. Papanek (1996) juxtaposed the endeavours of modern designers who strive to make the design process more systematic and scientific through adding reason, logic and intellect into the design process with those

of indigenous communities who follow feeling, sensation, revelation and intuition. He argued for a synthesis between these two approaches and reasoned that this will enable designers to add new knowledge to a range of related disciplines such as ergonomics, ecology, archaeology, anthropology and cultural studies. (Papanek in Margolin, 1996:56-57) These disciplines are not only publishing a vast amount of 'new knowledge' that was not previously available but by joining forces new fields of research opened up during the past twenty years. Some add direct value to design research such as ergonomics and some could be extremely useful as supplementary or complementary information or resources. These examples are numerous and it can be argued that the role of science is gaining ground in the world of design.

Sustainability

Sustainability is an area of concern to the design disciplines and is under constant discussion and investigation. Margolin (2002) identified a model that is considered to be a *sustainability model* of the world. This was the culmination of a number of efforts by the Club of Rome and the World Commission on Environment and Development³. This model looked at the world as a system of ecological checks and balances with finite resources. The model informed the Greens as well as the United Nations about strategic decisions that should be taken to 'save *the world*'. Margolin found this model wanting in its capability to address the expanding production and trade activities of the global economy that lead to large industrial segments ignoring it (Margolin, 2002; 81). Business and consumers operate on a different scale and Margolin (2002) identified this as an *expansion model* which projects an ever expanding world of products - despite efforts to plough materials back into different markets (recycling). It is obvious that these two models are in conflict with each other and Margolin even considered them to be on a collision course as the growing divide between rich and poor becomes evident.

The impact on product design is considerable with far reaching social consequences that requires scenarios such as consumer patterns to change, a different approach to the use of products and, most drastically of all, to reduce and decrease consumption. Winner (1992) looked at problems around the policy on technology innovation and came to the conclusion that modern politics can and will not facilitate the defining of a common good in technology policy. The clash between the developed and the developing world needs is too big. The ambition to change society to a common new goal is impossible. The question arises: whose criteria and for whom? The world is just a too diverse place to fulfil any such aspirations.

³ Margolin saw it fit to change some of the ideas in his first essay "global expansion or global equilibrium? Two models of development" into a more representative model that he called the 'equilibrium model' instead of the current 'sustainability model' to represent the characteristics more precisely and to, at the same time, enable the inclusion of the chaos theory in the models of development.(Margolin, 2002, footnote 10,p 89)

Design methodology

When one strives to consolidate all these issues into a workable design research methodology the issue of *flux* could once again evoke the *confluence of a brawl and necessity*. Design researchers use a number of methods when doing research. No single research methodology is able to account for the diversity of inputs and outputs to contemporary design practise and process. (Laurel, 2003:10). The research method called design experiment/design method is gaining popularity and, because of its usefulness to designers, provides a qualitative framework that accommodates the multiple disciplines active during the design research process (Laurel, 2003). Three key modes of design research are identified: research *into* design, research *through* design and research *for* design (Frayling, 1993 – 1994). There exist a number of other approaches and methods that are applied similar to the process of *bricolage*⁴. The methodology of action research and particularly Participatory Action Research (PAR) has gained ground as a preferred method in developing worlds⁵. With this approach the community becomes co-designers and gain a stake in the end product.

Public understanding of science

Marcuse (1964) stated that the development of modern industry and technological rationality undermined the base of individual rationality. Advanced industrial societies demand increased submission to increasing domination and administration and such mechanics of conformity produce a 'one-dimensional society' and a 'one-dimensional man'. Marcuse argued that tendencies toward technological rationality are producing a system of totalitarian social control and domination. He integrated the ideas of philosophy, social theory and politics and by the 1950's he perceived the

⁴ Bricolage is a common metaphor used for describing the multiple methodologies of qualitative research. A qualitative researcher is viewed as a bricoleur or a professional handy person who uses the tools of his/her methodological trade and whatever strategies are at hand to understand the phenomenon in question. The word was first used by Levi-Strauss in *The savage mind* (1966). Bricolage requires knowledge of the technology processes and situated knowledge to assist integration of the process of technology transfer into an existing landscape of human practices, technologies, materials, identities and working relations.

⁵ In the past decades various people-centered participatory appraisal methodologies have been developed, such as **Participatory Rural Appraisal (PRA)**, **Participatory Learning for Action (PLA)**, **Participatory Technology Development (PTD)**, **Rapid Appraisal of Agricultural Knowledge Systems (RAAKS)**, **Participatory Gender Analysis (PGA)** and **Participatory Poverty Assessment (PPA)**. A large number of participatory tools have been developed such as transects, mapping, Venn diagrams, different ways of interviewing, role playing and story telling. Rooted in these participatory tools, the Sustainable Livelihoods Approach was developed in the UK in the late 1990's. In this framework livelihoods and the enhancement of well-being are conceived in terms of different types of capital (natural, produced, financial/economic, human and social). These are perceived both as resources (inputs) that make livelihood strategies possible, and as outputs that make livelihoods meaningful and viable (COMPAS Magazine for endogenous development' Editorial. (eds. VAN T' HOOFT, K. REINTJES, C. HAVERKORT, B. AND HIEMSTRA, W., 7 September 2004:5).

unparalleled affluence of the consumer society to have created a society without opposition that threatened individuality and closed off possibilities of radical social change (Marcuse, 1964: xxv).

His work is closely related to the 1930 Frankfurt School's critical social theorists who criticized the key roles of mass culture and communications as forms of social control. Communication as a research facilitator is currently considered to be of growing importance when embarking on design projects in the developing world⁶. An area of communication that can be of considerable use to design research is that of science communication and its protégé called Public Understanding of Science (PUS). The methods applied by PUS can act as a conductor for sharing and understanding scientific information within communities, between communities and designers and among designers. When Miller (1998) initiated crucial empirical discussions on the (epistemological) requirements for 'understanding science and technology' he conceptualised the most crucial requirement for PUS as being civic scientific literacy.

The initial phase of the 'communication of science research' borrowed its conceptual framework from the attitudinal surveys that were being conducted for marketing products in the developed societies. The methodology, the tools of data collection and the methods of analysing the collected data was structured on the patterns that were developed by the marketing agencies. The origin of these marketing practices and research could be traced back to the early twentieth century. The large scale surveys that were the first time conducted in nineteen thirties probed the efficacy of radio and TV programmes and these became the basis for marketing research. Such probing of people's attitudes, perceptions, knowledge, etc. was introduced as major components for judging the potential markets for a product. By the sixties and seventies, on the one hand, '*aesthetics*' embedded in the culture of a community and science and technological information became the basis for '*product differentiation*'. However, as has been argued above in case of 'green revolution' the deeper scientific and technological information started influencing the aesthetics of communities and in turn the product design.

⁶ The 2005 Interdesign workshop on Alternative Transport included a communication team to assist in the design process. The role of the communication team is not well conceptualised but will develop over the next few years.

The debate on the 'deficit model'⁷ of science communication paved the way for treating public understanding of science as a cultural process and not just a product that needed to be sold to the planners. The premise is therefore currently generally accepted that the public communication of science and technology include the acknowledgement/communication of culture, economics, political and social values and worldviews. It is imperative that one should recognise the utilisation of scientific facts contextualised by the specific circumstances and needs of a given community. Raza (2002), for instance, stated that determinants of the thought complexities of communities in developing countries need more investigation in order to identify the factors that influence individual and group knowledge systems. He argued that *'the broad cognitive framework or worldview in which acquired knowledge is configured is a socio-cultural construct shaped by quotidian episodes experienced over generations'* (Raza & du Plessis, 2002:59). Research into knowledge systems therefore needed to be 'community centric'.⁸

When scientists realised that they have a responsibility to inform the public about their work and findings they initiated the field of PUS to facilitate dialogue between themselves and the various communities (publics) they need to inform. PUS accommodated not only the communication between the scientists and the public, but provided a space for both groups to measure and reflect on previously neglected areas such as the inherent scientific knowledge of rural traditional communities – considered to be one of different publics. PUS researchers were able to access, document and codify previous neglected areas of technological knowledge. Using the findings of data collected during surveys one is able to bring about perceptual changes within communities based on 'the known'. This means that the designer need not start the design process as a tabula rasa without any constraints or limitations. The findings of, for instance, field surveys that establish specific needs and current uses of products/processes provide information about the level of knowledge imbedded within the community

⁷ Durant (2000) discussed two models constructed to illustrate different perspectives on the science communication process. The first was the *deficit model* that was dependant on science as primary source of information with its origins based on the perspective that the public is ignorant about science with a tendency to misunderstand its facts, theories and processes. The premise was that the public needed the clear and organised knowledge generated by the scientists to make sense of the world at large. This was generally considered to be a 'developed world' approach and the science under discussion was considered to be the so-called 'hard sciences'.⁷ The second model was known as the democratic (interactive) model of science and had its origins in the fact that the public lacked confidence in decisions made on their behalf by scientists. To overcome these suspicions an open dialogue and consensus building process was required (Durant, 2000).

⁸ Raza defined 'community centric' research as: *'a collective which is repository of knowledge that has been generated through process of distillation of abstract ideas extracted from experiential episodes. The spectrum of such communities is quite wide in developing countries. At the one end of the spectrum are those communities which live in harmony with nature without disturbing the regenerative capabilities of eco-systems and who, for example, practise indigenous systems of medicine developed over centuries. On the other hand there are those artisans who have developed what are often referred to as innovative rural or indigenous technologies'* (Raza & du Plessis, 2002:59)

and thereby appropriate design measures can be established. During the authors' surveys in India amongst potters, for example, it was discovered that there are master kiln makers who cyclically rebuild the kilns that are yearly washed away by the monsoon rains. With each rebuild the problems of the previous year are rectified and new adaptations are introduced. This provides an enormous resource of information for researchers to tap into with indigenous scientific and technical information informing the design process. We found the wealth of information imbedded in the innovative constructing of kilns astonishing.

One could therefore argue that no other discipline is in a better position than Industrial Design to act as a synthesis to bring together a number of disciplines and to make the collective knowledge useful when designing a product or developing a new system.

Conclusion

In the spirit of *flux*, this presentation tried to highlight the diverse complexities appropriate to the sub theme Design Education and Community and Social Engagement. Attention was paid to the subtopics of design for development, culture and human factors in design, IKS, sustainability and universal design. Product design research in a developing country can provide opportunity to engage in a Heraclitan *brawl as a necessity* to address the needs of local communities. A fine example is when the green movement clearly indicated how the notion and attitude of designers changed as a consequence of public campaign and debate.

It was argued that the use of PUS as an investigative tool will lead to a better understanding of local (science) knowledge. This understanding of a community's level of knowledge should provide data on the socio-economical, cultural (political) as well as educational knowledge (epistemology) of a community. Only then will a product design project be able to act with some level of assurance that the product will have the buy-in (sustainability) by the community. The use of multi-disciplinarity and different research methods are promoted. The best one can do is to adopt appropriate research methodologies that will bridge the gap between the developed world's capabilities and the developing world's abilities.

Bibliography

- Birkeland, J. 2002. *Design for Sustainability. A sourcebook of integrated eco-logical solutions*. London. Earthscan.
- Blackburn, S. 2006. *Truth. A guide for the perplexed*. London. Penguin Books.
- Dormer, P. 1991. *The meanings of modern design. Towards the twentieth century*. London. Thames and Hudson.
- Durant J. 2000. Science communication: the challenge in Europe today. Paper presented at the DFID/UNESCO International workshop on science communication. London. 3–5 July 2000.
- Eboussi-Boulaga, F. 2000. The topic of change. in Karp, I & Masolo, D. 2000. *African philosophy as cultural enquiry*. Bloomington. Indiana Press.

- Frayling, C. 1993 – 1994. *Research in art and design. Royal College of art research papers* 1. no.1.
- Ghose, R. 1996. Design, development, culture and cultural legacies in Asia (pp187 – 203) in Margolin, V & Buchanan, R. (eds).1996. *The idea of design. A design issues reader*. London. MIT Press.
- Gibbons, M. (ed). 1994. *The new production of knowledge. The dynamics of science and research in contemporary societies*. London. SAGE Publication.
- Honderich, T. 1995, *The Oxford companion to Philosophy*. Oxford. Oxford University Press.
- Karp, I & Masolo, D. 2000. *African philosophy as cultural enquiry*. Bloomington. Indiana Press.
- Laurel, B. (ed) 2003. *Design research. Methods and perspectives*. Cambridge. The MIT Press.
- Marcuse, H. 1964. *One-dimensional man. Studies of the ideology of advanced industrial society*. London. Routledge.
- Margolin, V & Buchanan, R. (eds) 1996. *The Idea of Design. A Design Issues reader*. London. The MIT Press.
- Margolin, V. 2002. *The politics of the artificial*. Chicago. University of Chicago Press.
- Miller, J. *The measurement of civic scientific literacy in Public understanding of science* Volume 7. Number 3. July 1998; pp 203 – 223.
- Nietzsche, F. 1967. *The will to power*. ed Walter Kaufman, London. Wiedenfield & Nicolson.
- Noorman, K. & Uiterkamp, T. 1998. *Green households? Domestic consumers, environment and sustainability*. London. Earthscan Publications Ltd.
- Papaneck, V. The future isn't what it used to be. p 56 – 69. In : Margolin, V & Buchanan, R. (eds) 1996. *The Idea of Design. A Design Issues reader*. London. The MIT Press.
- Porritt, J. 1984. *Seeing Green. The politics of ecology explained*. Oxford. Basil Blackwell.
- Raza, G & du Plessis, H. 2002. *Science, craft and knowledge*. Pretoria. Protea Boekhuis.
- Spetnak, C & Capra, F. *Green politics. The global promise*. London. Paladin Grafton books.
- Thackara, J. 1988. *Design after modernism*. London. Thames and Hudson.
- Toke, D. 1990. *Green energy. A non-nuclear response to the greenhouse effect*. London. Green print.
- Whiteley, N. 1993. *Design for Society*. London. Reaktion Books.
- Winner, L. Citizen virtues in a technological order. *Inquiry* 35.nos.3 – 4 (September – December 1992):355.
- The Humane Village Journal. Volume 1. Issue 1. Toronto. The Humane Village Centre for Compassionate Design in collaboration with the ICSID '97 Programme Committee.



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He has published six books and more than 30 research papers, articles and reports. He also delivered a large number of lectures on Public Understanding of Science. He nucleated a research group and initiated research work in the area of Public Attitude towards and Understanding of Science and Communication in 1983 and administered the first national survey of public understanding of science

in 1989. Since then he carried out more than 20 large-scale national and cross-country survey studies among various groups of the population. He is experienced in all aspects of video production, planning, directing, post-production work, and dissemination.

He was awarded as the best subject expert for educational film in 1999 by the University Grants Commission of India. He was awarded the *Creative Literature Award*, Hindi Academy, 2001, for his poetry book 'Jazbon Ki Lau Tez Karo'. He was awarded the Urdu Academy Award for Science writings, Urdu Academy, Delhi, 2003. He acted as Director of the Jahangirabad Media Institute, Lucknow in 2005 and 2006.