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Design as a Social Process: Bodies, Brains and Social Aspects of Designing

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1. Introduction

The concept of design as a social process accords with the constructivist position on knowledge generation, and is widely supported in the design research literature (see, for example, Amabile, 1983; Berger & Luckman, 1987; Buchiarelli, 1984; Chung & Whitefield, 1999; Cooper & Love, 1993; Cross & Cross, 1996; Dilnot, 1982; Dorsa & Walker, 1999; Gregory & Hedberg, 2001; Guba, 1990; Papanek, 1984; Verma, 1997). Viewing design as a social process has, however, both advantages and disadvantages. Of key importance to the field of design research is how the concept of 'design as a social process' articulates with other design theories and with theories from other disciplines to support the development of a coherent body of theory about designing and designs.

This paper takes a critical perspective. It identifies and pragmatically explores four topic areas important to understanding the practical connections and interrelationships between the concepts of *design* and *social process* as they relate to improving the design of new products, systems and services. The paper pays places particular emphasis on maximising coherent connections with concepts, theories and research findings in other disciplines. The analyses in this paper derive from four research projects: the author's PhD into the inclusion of social, ethical and environmental factors in engineering design theory; ongoing study of the physiological mechanisms that underpin human designing; an exploration of the roles of affective (feeling) processes in design cognition; and the development of a coherent theory frame that integrates design theories and organisational theories.

Most designing is undertaken in commercial, and thus social *contexts* (see, for example, Buchiarelli, 1984; Friedman & Tellefsen, 1997; Tellefsen, 2001, 2000). Designers play key roles in the conversion of new scientific knowledge into designed real world products, systems and services that are the physical manifestations of innovation processes. This is seen as a key driver of economic and social development in developed and developing nations (see, for example, Academy of Finland, 1997; Commonwealth of Australia, 2001; Dept of Industry Science and Resources, 1999, pp. 3, 9-10; Innovation Summit Implementation Group, 2000; Leith, 1995; National Science Foundation, 2001, 1998; The British Council, 2001). Increasingly, the main modality of designing is through multidisciplinary design teams: a practice that is well established in design fields with a high value and high levels of design input such as spacecraft and aerospace design work. Multidisciplinary design teams are now increasingly being adopted in less-technical design domains: the days of the genius individual designer have all but disappeared. These changes are mainly as a result of: increasing levels of complexity in designed artifacts; increased emphasis on the participation of other stakeholders (e.g. users) in design processes; and continuing specialisation in design education. The use of multidisciplinary design teams is a substantial shift from 'single domain' designing, in which a design is undertaken by one or

more designers in a single discipline who call on technical information from experts in other disciplines, and from 'serial' designing in which experts from individual domains undertake work on a design in sequence. In all of these forms of designing, the design processes depend on social communication between the stakeholders and their representatives for satisfactory progress of the design outcome. A key question, however, is how, and whether, theories about *social activity* are epistemologically best articulated with theories about the *activity of designing.*

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2. Dimensions of 'Design as a Social Process'

For the field of Design Research, the most important issue in deciding whether, or how, to bring together the concepts of 'design' and 'social process' is how such a move contributes to building a coherent body of theory about designing and designs. The justification and validation of co-joining specific theories in these areas are dependent on: how well the result comports with existing theories in these fields and with well-established theories from other disciplines; and on the strength of the epistemological foundations, especially in terms of empirical data and the phenomena being represented. For the concept 'design as a social process', several topic areas are of interest in exploring the measure of its epistemological coherency. These include:

A. Process issues: How do design processes and social processes overlap and interact?
B. Definitions: What are the bounds of the concepts of 'design' and 'social process'
C. Human Processes: How are the ways human designing is shaped by social processes actualised by individual physiological processes
D. Epistemological issues: Which epistemological perspective is best to explore whether and how design is a social process? How will radical changes due to new knowledge from cognitive-neuroscience impact on the relevance of observation-based human science disciplines such as psychology and sociology in whether, or how, design is best viewed as a social process?

Clarifying the practicalities of viewing design as a social process requires exploring these topic areas in more detail.

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3. Process Issues

Exploring whether or how designing should be viewed as a social process prompts the question 'can designing occur outside of being a social process'? There are two parts to the question. The first is to ask whether, for an individual, *all* designing must, at root, depend on social interactions. The second is to ask whether day-to-day designing must always be, or is better, regarded as a social process, or whether it is better regarded as an individual activity that is undertaken in a social context.

The first issue (whether designing is essentially determined by social interactions) is dependent on as yet unresolved philosophical arguments as to: whether all symbolism depends on social interactions; whether cognition is more than a conscious process that depends on symbol processing; and whether the human activity of designing, in

terms of what happens inside an individual, is essentially dependent on symbols derived from social interaction. Recent findings from research into the affective basis of cognition suggest that neither of these is correct (see, for example, Damasio, 1999, 1994; Love, 2001; Sloman, 2001). There is also everyday anecdotal evidence that designing may occur without being essentially part of a social process, e.g. the role of designing in personal projects such as: individual doodling, syncopated movement, and music made for oneself. It is clear, however that social interaction, like design outcomes can act as a major *amplifier* of analysis, symbol generation and symbol use (Agre, 2000). What is not clear is whether these individual human design processes and mechanisms are *essentially* dependent on social processes. This is a key issue in deciding whether it is epistemologically better to found theories about designing on the idea that they are social activities or not. In times of epistemological uncertainty, it is usually better to separate concepts rather than unjustifiably conflate them: conceptual identity has precedence over conceptual equivalence when building new theory. Together, these factors suggest it is better to keep the concepts of 'design' and 'social process' separate.

The second issue involves deciding whether designing can be undertaken at an individual level, independent of social interactions, through the use of self generated symbols or symbols derived at other times via social processes. Clarity about what is meant by 'designing' and 'social process' is important here. O'Docherty (1964) counseled researchers to be careful to choose definitions that do not prove useless because they include everything and hence define nothing. The issue of definitions is addressed in more detail in the next section. In general terms, it is clear individual designers or designers within design teams undertake social interactions as part of or associated with design processes; use symbols and practices that have been developed as a result of interactions with others; create designed outcomes that will be socially situated; and draw on knowledge embodied in a field of knowers. These do not repudiate the possibility that designing can be undertaken individually, in moments independent of social interaction. They are insufficient evidence, at this stage, to confirm that designing is therefore always better regarded as a social process. Other factors relating to definitions, the human processes, and epistemological coherency matter also.

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4. Definitions

The need for clarity in terminology is pressing. A review of definitions of 'design' and 'design process' in over 400 publications showed that there were approximately as many definitions of 'design' as authors (Love, 2000, 1998). In many cases, authors used the terms 'design' or 'design process' in ways different from how they had explicitly defined them. It is not uncommon to find different and contradictory meanings evident in the same text, paragraph or even sentence. The nominalization of 'designing' (a verb referring to an activity) into 'design' (a noun concept) compounds the confusion. Some of the variety of meanings loosely attributed to the term, 'design' include:

- 'The activity of designing'
- 'Specification for the manufacture of an artifact, system or service'

- 'An artifact'
- 'Humans and parts of humans' (whether designing or not) as in 'God designed humans' and ' the brain is designed to...'

As all human artificial arrangements (including language and knowledge) can be regarded as products of human designing (Simon, 1981), then the term design becomes problematic (as O'Doherty (1964) observed) because it includes too much to provide conceptual precision.

Similar problems are evident in relation to the phrase 'social process'. For social constructivists such as Berger and Luckman (1987), all knowledge creation is a social process. Consequently, all activity that depends on the 'body of human knowledge' in some way is also part of a social process, regardless of whether the activity is undertaken by an individual alone. This perspective requires care because it is important to avoid over extending the concept of 'social process' so that *all* is social process (e.g. thinking feeling, behaving, conceiving, deciding) and, like 'design', losing the analytical explanatory power of the concept of social process because all is subsumed within it. If these unhelpfully extended meanings of 'design' and 'social process' are brought together, then 'design as a social process' encompasses so many processes and outcomes that the phrase comes very close to meaning ''everything' as 'everything'. As a result, the terminological and conceptual precision necessary to sound theory making is lost.

It is also important in using the term 'designing', to make sure its meaning is not unduly diluted by inadvertently and inappropriately including other activities that are already well defined elsewhere (see, for example, Love, 2002, 2001, 2000). Examples include the differences between designing and information gathering, and between designing and calculating. If 'designing' is defined as including *all* activities that designers undertake, it loses its specificity and usefulness in building theory, and becomes useless in theorising about design as a social process because it is terminologically insufficient to differentiate between designing, social process and any other activities involved.

Prior research (Love, 2001, 2001) indicated it is necessary to distinguish between the internal and external activities of designing to maintain epistemological coherence. The following definitions were developed to improve on previous definitions in the literature by addressing their epistemological shortfalls and providing a sound basis for building design theories that are coherent with developments in other disciplines. They align with outcomes of similar analyses by Coyne and Snodgrass (1993)

- 'Design' - a noun referring to a *specification* for making a particular artefact or for undertaking a particular activity. A distinction is drawn here between a *design* and an artefact - the design is the basis for and precursor to the making of the artefact. In this sense, this distinguishes the outcomes of designing from the outputs of craft or art alone.
- 'Designing' - non-routine human internal activity leading to the production of a *design*.
- 'Designer' - someone who is, has been, or will be *designing*. Someone who creates *designs*

- 'Design process' - any process or activity that includes at least one act of 'designing' alongside other activities such as, calculating, drawing, information collection many of which are, or can be, routine or automated.

The argument for separating external and internal aspects of designing (that they are epistemologically incommensurate (Popper, 1976)) also applies to social activities. It implies that 'social process' should be defined to reflect only the external aspects of interactions between people, e.g.

- 'Social process' - any process or activity that includes at least one act of social interaction between people alongside other activities.

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5. Human Processes: Underlying Causal Explanations

Developing theories of 'design as a social process' that fit with hard-won human knowledge across a wide variety of disciplines to a large extent depends on understanding of the means by which the human processes of designing and social processes are actualized. In the case of both 'designing' and 'social process': both are human activities; and both depend on human cognition, feelings, emotions, learning, understanding, and judgment. Any explanation of 'design as a social processes' should be able to reach deep into an understanding of their causal mechanisms (mainly derived from research via other disciplines). It would be expected that theories about 'design as a social process' would build on theories about these causal mechanisms in unambiguous and transparent ways.

Both designing and social processes depend strongly on empathy and other dynamic tacit interpersonal communication processes. In the case of designing, empathy underpins, e.g. the means of mentally envisioning whether users would be happy with a particular solution. It underpins, however, many other internal sub-processes of designing (see, for example, for other aspects Damasio, 1994; Love, 2000; Love, 1999). In social processes, empathy refers to those activities by which one individual 'feels' what is happening in another individual – an essential aspect of communication. If empathy and these other tacit interpersonal processes are not to be regarded as magic or telepathic events of a sort unknowable to scientific inquiry then they must be explicable in terms of individuals' human internal physiological processes. They cannot be explained causally in any other manner whether via information (about the other) and information flows, or in terms of social dynamics. This is because anything other than human internal physiology offers only external correlatory indicators rather than causal foundations for theory about either the realities of social processes or communication modalities between individuals.

New research findings in neurology, neuro-psychology, artificial intelligence, information processing, design research, biology, endocrinology, cognitive science, ethology brought together by the combined effort of researchers across these disciplines, are now resulting in an understanding of the underlying internal human physiological processes by which both designing and social processes come into being and are directed through individuals' conscious and unconscious agency. What is emerging is a picture that involves many complex body systems that bring together

feelings, emotions, and motor responses as part and parcel of cognition.
From this perspective, body systems can be seen as physiological precursors, in a primitive organism, produce motor responses to improve the organism's relationship with its environment, e.g. by protecting it and ensuing long term survival (Damasio, 1999). The potential of these primitive cognito-affective-motor systems have been extended in humans by being overlaid with other more sophisticated systems built from and on them. Together these result in a human's brain and associated neurological, hormonal, visceral and skeletal systems operating in concert to create designs and undertake social processes. Human cognito-affective-motor physiological systems and processes are not simple, but they are becoming increasingly well understood through brain research.

The physiological actualisation of human internal design activities is commonly based on internally held representations of contexts – substantially under conscious cognitive control. In mechanism these echo the processes used for simpler responses between humans as organisms to their external environmental circumstances through internal representations held in both mind and body. The context of internal activities of designing may relate to human social interactions but this doesn't mean that all contextual interactions are social process. At a neurobiological level, some aspects of internal designing are enabled by primary emotion/feeling systems and secondary systems in the neo cortex that are not necessarily created by social interactions – any interactions inside and outside an individual will do (Damasio, 1999, 1994). This means that some internal aspects of designing are not part of 'social process' and hence bound the utility of defining design as social process.

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6. Epistemological Issues

The discussion in the previous sections forms the basis for describing and addressing epistemological issues. The main epistemological issue, the underlying question, is 'How can we define 'design as a social process' in ways that comport best with other well-established human knowledge?' This approach of choosing the meanings of terms ('design', 'social process' and 'design as social process') to build coherent theory contrasts with approaches that try to identify or argue that "'design' or 'social process' *is* 'X'" In most cases, in epistemological terms, the latter approaches are unhelpfully 'wrong headed'.

One of the difficulties with research and theorymaking associated with both designing and social process is that they have been built on second hand data, i.e. observations of human behaviours that provide correlations rather than causal explanations. These external behaviours are the precedents and antecedents of designing and human social interactions. They are *consequences* of the processes rather than the activities themselves. Making theory about designing and social processes by observing behaviour is as epistemologically and practically problematic as trying to infer the electronic circuits of a calculator by observing the numbers on its display. (In theory, there is no upper bound to the number of possible models of internal functioning that can represent external behaviour.) To understand and make accurate theory about

designing and social processes it is necessary to look at the human internal processes, as it is these that provide causal information.

In this context, there is emerging a radical shift in all disciplines that have so far depended on using tacitly assumed models of internal functioning to provide a reference point for building theory on correlatory evidence from observations of external behaviours. This radical change emerging in disciplines such as psychology, sociology, and other social sciences is due to new findings of brain research. These new findings from cognitive neuroscience and other physiologically based fields studying the foundations of human agency are beginning to offer new and *direct* causal knowledge about human functioning that has been inaccessible previously. The implications about theorymaking in the field of design research are literally radical. Potentially, they completely replace (as in delete all and insert) many of the existing theories about designing and social processes that have been based on theories from psychology, informatics and the social sciences – disciplines that are themselves radically impacted by these new developments.

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7. Conclusions and Implications

Designing is a human activity often undertaken in social contexts. Many aspects of designing are undertaken within individuals. There are many processes involving people in which some of the participant are undertaking internally, design activities.

This paper has suggests that it is important to differentiate between ‘the human internal processes of designing’ and ‘external processes, many of which are social in nature, that include at least one individual undertaking internal design activities’. The paper suggests that a convenient terminological distinction between these internal and external aspects is to use the term ‘design process’ to refer to the external activities and the term ‘designing’ to refer to the physiologically actualized internal design activities.

The focus of this paper is on building coherent theory foundations or design research. Part of this endeavour is to establish clear definitions of the terms, ‘design process’ and ‘social process’, that avoid conflation and reflect epistemological differences in their relationships to other concepts and to the empirical realities that they participate in representing in the construction of other theories. The analyses developed in previous sections show the following relationships:

A ‘design process’	May be embedded in	A ‘social process’
A ‘social process’	May be embedded in	A ‘design process’
‘Internal activity of designing in an individual’	May be embedded in	‘Social processes’
‘Social processes’	May be influenced by	‘Individuals’ internal activities of designing’
‘Social processes’ in combination with a ‘design process’ and	May result in	A design for a ‘design process’

'individuals' internal activities of designing'		
'Individuals' internal design activity'	May result in	A design for a 'social process'

These relationships distinguish between 'design process', 'social process' and 'the internal human activity of designing', and map out possibilities for causal relationships between them. Together, they start to establish a basis for understanding the character of the relationship between designing and social processes on which further work can be developed. The natural extension of the arguments presented in this paper is a move away from sociological and psychological theory building about design and social process. To date these have depended on tacit assumptions about human internal function (e.g. how people think, respond, are motivated) based on correlatory evidence of external human behaviours. It is now increasingly possible to build design theory and social process theory on direct observations of human internal processes due to new developments in cognitive neuroscience. These new developments offer the basis for using *causal* relationships as a basis for theory making, rather than the second-hand correlatory data on which many existing social theories are based.

The implications are profound and radical. They require careful definition of concepts of 'design', 'social process', 'design process' and associated concepts that will continue to be relevant when the human internal mechanisms that result in their actualisation are understood.

References

Academy of Finland. (1997). National Strategy for Centres of Excellence in Research. Helsinki: EDITA.

Agre, P. (2000). Notes on the new design space. Available: http://dlis.gseis.ucla.edu/pagre/.

Amabile, T. M. (1983). The Social Psychology of Creativity. New York: Springer-Verlag.

Berger, P., & Luckman, T. (1987). The Social Construction of Reality. England: Penguin Books.

Buchiarelli, L. L. (1984). Reflective Practice in Engineering Design. Design Studies, 5(3), 185-190.

Chung, S., & Whitefield, A. (1999). A comparison of the social standing of the design professions in Korea and Australia. Design Studies, 20(4), 381-396.

Commonwealth of Australia. (2001). Backing Australia Ability - An Innovation Action Plan for the Future. Canberra: Commonwealth of Australia.

Cooper, T., & Love, T. (1993). Community Perspectives on Planning. Social Impact(July), 6-7.

Coyne, R. D., & Snodgrass, A. (1993). Rescuing CAD from Rationalism. Design Studies, 14(2), 100-123.

Cross, N., & Cross, A. C. (1996). Observations of Teamwork and Social Processes in Design. In N. Cross & H. Christiaans & K. Dorst (Eds.), Analysing Design Activity. Chichester, UK: Joan Wylie & Sons Ltd.

Damasio, A. (1994). Descartes' Error: Emotion, Reason and the Human Brain. New York: Grosset.

Damasio, A. (1999). The Feeling of What Happens. London: Random House.

Dept of Industry Science and Resources. (1999). Shaping Australia's Future. Innovation - Framework Paper. Canberra: DISR.

Dilnot, C. (1982). Design as a socially significant activity: an introduction. Design Studies, 3(3), 139–146.

Dorsa, E., & Walker, S. (1999). Making Design Work: Sustainability, Product Design and Social Equity. Paper presented at the Chicago 99 Design Education Conference Proceedings, Chicago.

Friedman, K., & Tellefsen, B. (1997). Consumer and Designer as Product Development Partners. Paper presented at the Consumer-Centered Design, Kuopio Academy of Craft and Design.

Gregory, J., & Hedberg, C. (2001). Working Together, Social, Technical and Formal Practices: Contrasting IS Design Strategies in Health Care. Paper presented at the IT in Health Care: Sociotechnical Approaches, Rotterdam 6-7 Sept.

Guba, E. C. (Ed.). (1990). The Paradigm Dialog. California: Sage Publications Inc.

Innovation Summit Implementation Group. (2000). Innovation - Unlocking the Future. Final Report of the Innovation Summit Implementation Group. Canberra: ISR.

Leith, A. T. (1995). NAS/NAE Report: Recommendations for Federal S&T Funding, [html document]. American Institute of Physics [2001, Sept].

Love, T. (1998). Social, environmental and ethical factors in engineering design theory: a post positivist approach. Unpublished PhD thesis, University of Western Australia, Perth.

Love, T. (1999). Values role in computer assisted designing. International Journal of Design Computing, 1.

Love, T. (2000). Computerising Affective Design Cognition. International Journal of Design Computing, 2.

Love, T. (2000). Educating those involved in changing human futures: a more coherent programme for design education. In C. Swann & E. Young (Eds.), Re-inventing Design Education in the University (pp. 242-248). Perth: School of Design, Curtin University of Technology.

Love, T. (2000). Philosophy of Design: a Meta-theoretical Structure for Design Theory. Design Studies, 21(3), 293-313.

Love, T. (2001). Concepts and Affects in Computational and Cognitive Models of Designing. In J. S. Gero & M. L. Maher (Eds.), Computational and Cognitive Models of Creative Design (pp. 3-23). Sydney: University of Sydney.

Love, T. (2001). Strategic Management of Knowledge for Designers: Meta-Theoretical Hierarchy as a Foundation for Knowledge Management Tools. In J. Gero & K. Hori (Eds.), Strategic Knowledge and Concept Formation (pp. 3-16). Sydney: Key Centre of Design Computing and Cognition, University of Sydney.

Love, T. (2002). Constructing a coherent cross-disciplinary body of theory about designing and designs: some philosophical issues. International Journal of Design Studies, 23(3), 345-361.

National Science Foundation. (1998). Norway's Science Policy, [html document]. National Science Foundation. Available: www.nsf.gov/home/int/europe/reports/98.htm [2001, July].

National Science Foundation. (2001). NSF GPRA Strategic Plan FY 2001-2006: III. Outcome Goals: Investing in todays promise for tomorrow's achievement, [html document]. National Science Foundation. Available: www.nsf.gov/pubs/2001/nsf0104/outcome.htm [2001, Sept].

O'Doherty, E. F. (1964). Psychological Aspects of the Creative Act. In J. C. Jones & D. G. Thornley (Eds.), Conference on design methods (pp. 197–204). New York: Macmillan.

Papanek, V. (1984). Design for the Real World: Human Ecology and Social Change (2nd ed.). London: Thames and Hudson.

Popper, K. (1976). Unended Quest. Illinois: Open Court.

Simon, H. A. (1981). The Sciences of the Artificial (2nd ed.). Cambridge Mass: MIT Press.

Sloman, A. (2001, 7 May 2001). Cognition and Affect, Architectures and Emotions, [html file]. Available: www.cs.bham.ac.uk/~axs/cogaff.html [2001, May].

Tellefsen, B. (2000). Cross-Functional and Inter-Disciplinary Integration for Doctoral Education in Design: Theory and Experience. In D. Durling & K. Friedman (Eds.), Doctoral Education in Design: Foundations for the Future, . UK: Staffordshire University Press.

Tellefsen, B. (2001). Market orientation and partnership learning in product development and design. In S. Ilstad (Ed.), Industrial Organization and Business Management (pp. 396-405). Trondheim: Tapir Akademiske Forlag.

The British Council. (2001). Innovation UK: Science, Wealth Creation and Social Well-being in Britain. The British Council. Available: http://www.britishcouncil.org/science/gost/innovationuk.pdf

Verma, N. (1997). Design theory education:how useful is previous design experience. Design Studies, 18 (1), 89-100.