

Dr Robert Young



The Centre for Design Research



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Developing an Integrated Model of Designing to Aid Understanding of the Complexity Paradigm in Design Practice

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Introduction

- Research concerns - nature of design practice to support the role of design in society
- Development of an integrated, relational model of design combining descriptions of design content and process to improve the designer's ability to navigate complex projects
- Approach - is the perspective of the design practitioner and their sense making requirement for models of design practice
- Involves the theoretical critique of existing models of design to establish the relationship between theory and practice
- Evaluation of the resultant content based model of design through action-research to illustrate its relevance and utility in practical applications.
- Triangulation of content and process based models with context based thinking.

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Various types of models have been developed in the past

- Useful devices for describing design but have not affected the way design has been carried out
- Reason for this could be that their use of scientific method as a precedent for developing design methodology was misguided.
- Scientific method, was seriously questioned by the works of Kuhn (1962) and Popper (1963)
- Cross *et al* (1981) re-evaluated the rationale behind scientific method from an epistemological perspective and concluded that scientific method is contrary to design!

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The formation and function of models

- So where does this leave the use of models in design methods research and what implications might this assessment have for the development of models of the design process in the future?
- In 1972, Rivett described the function of a model as:
 - A convenient way of representing the total experience which we possess, of then deducing from that experience whether we are in the presence of pattern and law and, if so, of showing how such patterns and laws can be used to predict the future. Rivett (1972)
- Keywords from this definition are: convenient, represent experience, deducing, pattern and predict.

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Functions of models in science

- simplification of complexity,
- presentation of general principles,
- identification of pattern,
- explanation of natural phenomena,
- prediction of future events.
- These show an obsession with a search for pattern and the representation of general principles and laws

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Definition of the function of a model in keeping with design

- Perhaps a more suitable definition of the function of a model in relation to design was that given by Echenique in 1963;
 - **'A model is simply a representation of relevant characteristics of a reality.....a means of expressing certain characteristics of an object, or system, that exists, existed, or might exist'.** Echenique (1963)
- This definition makes the point that models are only approximations of real-world phenomena.

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A model description of design

- What is an appropriate model description of design
- Scientific method has concentrated on the nodes of a systematic approach to design problem-solving
- If we accept some sort of differentiation of the whole process into various stages, any new model should focus on the movement between the stages
- In 1991, Oxman's research into experience-based knowledge provided a way forward
- Theoretical basis for a knowledge-based dynamic model of design

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Activity based design process models

- During the early period of design research the bias towards scientific method blinded researchers to the importance of the intuitive component in design
- Design reality is highly complex
- What then should design research establish?
- Activity based models of the design process have the potential for direct application in the process of designing!
- Models need to be more attentive to design content and context rather than just the process being followed

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Conclusions from the theoretical critique of existing models of design:

- Oxman's research into *experience-based knowledge*
- Cross's conclusions that 'know that' and 'know how' knowledge are necessary to design but '*know how*' is central to the activity
- Echenique's function of a model; to provide a simplified and intelligible picture of *reality* in order to understand it better', and
- Jones's analogy of design methods as *navigational tools* to plot a design course and control it.

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Derivation of a content-based model of design from a complex systems project

- The design of communications consoles for the emergency services was used as a complex system design project case study

Five key factors from the analysis

- Communications,
- Knowledge and information,
- Personality, attitude and values,
- Design strategy and policy ; and
- The level of design decision making.



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Archer's model of levels of design

- Research revealed that Archer had previously carried out a study of levels of design thinking which showed that:
 - **Information flow has equal importance to creative solution finding**
 - **That knowledge elicitation makes information public and therefore undermines power and authority.**
- He concluded that power and authority are almost exclusively concerned with position in a hierarchy with respect to information.

Design at the level of decision	- where the individual designer takes a decision about one small factor in the design task
Design at the level of the product	- is usually the level at which people think and talk about design, where products can be taken as referring to things or systems, which can be designed by the individual designer working alone
Design at the level of the project	- design at this level is the communal activity of the team or organization

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Jones' extended design process

- Jones, identified the need to appreciate products by understanding their whole.
- He talked about the social, economic and political basis of the existence of a single product in order to address human needs.
- He recognised a need for change as a result of the increased complexity of new products brought about by technological developments.

1 Community level
2 Systems level
3 Products level
4 Components level

A simplified model of the extended design process devised by Jones. It demonstrates the need for a holistic approach to design methods that spans all levels of a social, physical and technological system (Bull)

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Derivation of a content-based model- a new model of levels of design

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Correlation of the model with systems design literature

- Jones' post design methods work
- Gharajedaghi's 'System thinking: managing chaos and complexity'
- Mitchell's 'Redefining Designing: from form to experience'
- Schon's concept of reflective practice
- Popper's model of different worlds

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Educational application of the model

- Since the early 1990s, the model has been used in the educational process of successive year groups of industrial design students
- An action research reflective practice process of enquiry, as advocated by McNiff, has been used to determine the utility of the model as a learning aid
- Each students' major project brief was analysed in a cross reference matrix
- Review shows that the application of the model concurs with Jones's way forward of using models of designing as tools to aid navigation of design content and to control the design process.

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Recent adoptions and adaptations

- Design Innovation Education Centre (DIEC) initiative
- Spirit of Creation - an early adopter
- Livework - an early adaptor
- A content-based model to support designing - which leans towards a context based model
 - Enables design issues to be mapped thereby contextualising their complexity
 - Does not enable contextualisation in relation to the design process that they are part of
 - To do this requires cross referencing between content and process

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DIEC marketing design fusion - process model

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