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## **A comparison of methods for researching into drawing within the field of design**

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# A comparison of methods for researching into drawing within the field of design

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## Abstract

*The methods for researching any given phenomenon are likely to have an important influence on the nature of the findings. This paper sets out to contrast two very different strategies used for research into design communication in recent research programmes. The first established a foundation onto which more focussed research could be built. The second programme was a much larger research project involving academics from more than one university department. The paper presents an examination of the theoretical base of the two research methods to uncover something of their traditional application since this has an influence on their perceived value as research methods. The conclusion is concerned with the issues of operating a 'hybrid' strategy in the most recent studies of drawing and designing.*

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## Two Cultures of Research

Twentieth century philosophical enquiry has sought to question the nature of scientific 'truth'. According to McNeill the natural sciences have been guilty of assuming that:

'... the natural world has an independent existence of its own, which is as it is regardless of those who are studying it, and which is governed by laws which can be discovered by the research scientist if only the right methods can be developed' <sup>1</sup>.

Carl Hempel, in his book *The Philosophy of Natural Science*, divides scientific enquiry into two major groups, the empirical and the non-empirical sciences. The empirical sciences, by which Hempel is referring to the social as well as the natural sciences are further subdivided. They are concerned with systematic observation, interviews, surveys, psychological or clinical testing and many types of examination <sup>2</sup>. He identifies the dependence on empirical evidence as the distinguishing characteristic of the empirical sciences and contrasts it with the non-empirical disciplines of logic and pure mathematics whose propositions are proved without essential reference to empirically available phenomena.

Experimentation is primarily a logical testing method requiring the formulation of hypotheses from observations or theories. Various authors have identified the exploitation of experimentation and shown its uses in a number of contexts. Parlett and Hamilton<sup>3</sup> refer to its function in an evaluative methodology for educational development; Kidder<sup>4</sup> examines the suitability of experimentation in a number of social research situations and Hempel, referred to above, uses a selection of medical studies to describe the functioning of the methodology. In

each of these cases the authors refer to the logic of this method as 'hypothetico-deductive'. Hempel's studies, using the hypothetico-deductive method, quite openly reveal a weakness of such a strategy and show why the social sciences particularly have proposed alternative research methods. In testing the validity of hypotheses, assumptions must be made regarding the variables which relate to any given phenomenon. These can be subdivided into those that are perceived to be controlled by the experimenter, termed the 'independent' variables, and those that vary as a result of the actions, termed 'dependant' variables. An investigative strategy based on these assumptions begs two questions:

- a) is it possible to identify and hold so-called independent variables steady?
- b) if the identification of such variables is based on the values and assumptions of the scientist, who is to say that these values are true or correct for all times?

Thomas Kuhn has raised the notion that natural scientific knowledge does not exist independently and objectively but is constructed by the science community within a framework of common assumptions which (at the risk of over-simplification of his position) he terms 'paradigms'. To use Kuhn's term the problem for any given piece of research may be to illuminate the nature of the paradigm (or paradigms) rather than simply examining the phenomenon which evolves under them. Thus researchers need to be confident that their methods openly reveal their value systems and fairly acknowledge the weaknesses inherent in much of the accepted research methodology.

## A Case-Study Approach to Drawing Research

A case-study involves the detailed examination of a single example of whatever the researcher wishes to investigate. Case-studies make no claim to be representative - the essence of the technique resides in the fact that each subject studied, whether it be an individual, a group, an event or an institution is treated as a unit on its own. Case-study offers a respected but eclectic strategy. Care must be exercised in viewing it as a methodological package since it can incorporate any particular methods deemed appropriate, though the less statistical methods are more usual. Such techniques can include participant and non-participant observation, various categories of interview, audio-visual recording, field note taking, document collection and negotiation of products e.g., the discussion of the accuracy of an account with those involved. Sociological researchers differ on how this might be best achieved. Some adopt a very covert approach in their studies, not disclosing their true purpose while others are emphatic that the researcher should be completely open about what he or she is doing via 'fully participant' studies. Opportunities for extended observation are not usually available and therefore the interview assumes a high profile. The interview can be as focussed or as wide-ranging as the interviewer wishes but the advantages of checking observation by interview and vice versa should not be overlooked. Interview strategies are various but Kidder has identified focussed, clinical and non-directive as a means of distinguishing style and objectives. It is proposed the third group are useful when :

'...investigators are scouting a new area of research or when they want to find out what the basic issues are, how people conceptualise the topic, what terminology is used by respondents and what is their level of understanding'<sup>5</sup>

While a case-study approach is largely qualitative it can be used in conjunction with hypotheses. Bromley<sup>6</sup> provides a salutary warning concerning the collection of information via case-studies. With reference to a number of studies drawn from the medical and psychological disciplines he stresses the need to keep fact and opinion separate, even though opinions are employed to interpret the facts.

Another important aspect of the conduct of case-study research involves the comparison of observations and statements via a process of 'triangulation', in order to note points of agreement

and disagreement. At the end of the day, however, the researcher or research team has to put a construction on the evidence and for this reason some researchers have advised including the 'raw' data as well as the interpreted (cooked !) data when presenting the final report. In this way later researchers may consider for themselves the relationship between the interpretation and the data.

## A Foundation of Illumination

The National Society for Education in Art and Design (NSEAD) funded the author to undertake an examination of the functions of drawing for those engaged in three-dimensional design. This exploited case-study analysis based on Kidder's non-directive interviewing; that is, it was a new area of research and it was not at all obvious what the nature of the enquiry should be. The case-studies included a wide spectrum of professionals including sculptors, engineers, craftspeople, architects and industrial designers. The analysis involved looking for commonalities of opinion and was based on transcripts of each interview. While it was possible to make some assumptions regarding their uses of drawing (indeed it was necessary in order to structure an interview plan), it was important that the interviews facilitated, and encouraged, the unexpected. Questions were as open as possible and the direction of the conversation was allowed to exploit opportunities. Pressure of time limited the opportunity to reinforce the interviews with a period of observation.

The encouragement of the unexpected turned out to be a vital aspect of the research. It allowed the conversations to address drawing functions other than those concerned with the anticipated 'communication'. Drawing functions concerned with the manipulation and exploration of information were at least equal in importance to those for communication. This picture did not gradually emerge since it was not at all obvious that such a picture was there to be seen in the first place. Rather it 'clicked' into place once the analysis of the transcripts was undertaken. This illuminative advantage of the strategy should not be dismissed lightly. An alternative strategy based upon in-depth studies of known drawing practices might have missed this. It was not possible to test or quantify the observations but this was not part of the remit. It merely identified the presence of phenomena via the opinions of a small number of subjects. However, having been prompted to the existence of such phenomena other, more appropriate, strategies can be brought into play. Thus a symbiotic rather than a competitive relationship exists between

research strategies. The findings from the NSEAD research programme are available in published papers<sup>7,8</sup>.

### **Experimental Research - Drawing and Computer Supported Cooperative Working (CSCW)**

The second major research programme had a wider remit than the first and involved a larger number of researchers. The author was part of a team working in the field of Computer Supported Cooperative Working (CSCW) based at Loughborough University. Recently a number of studies in the area of CSCW have been undertaken, mostly in North America, aimed at investigating the activities taking place during group design (Tang & Leifer<sup>9</sup>, Bly<sup>10</sup>). Published work had an important influence on the conduct of the Loughborough research, providing models for examination and criticism. The stated objective of the research was the identification of the communicational requirements of pairs of designers who were located remotely from each other but linked by computer technology. The project came to be known as ROCOCO (from 'Remote Communication and Cooperation'). Several researchers were involved in investigations of non-verbal communication, including drawing and gesture, and verbal communication.

The ROCOCO project proposed to contrast experimentally the design-based activities of pairs of subjects working proximally (and with conventional paper and pens), termed Phase One, with similar subjects linked by computer technology, termed Phase Two. The experimental design aimed to identify and control the independent variables such as design ability, experience etc. so that changes in dependant variables could become the subject of our conclusions. Such conclusions involved the effect of impoverishments to the communication technology and the relative use made of the various modes or channels of communication including drawing. Phase One consisted of six experiments each comprising one pair of student designers as subjects. Phase two consisted of twenty experiments which sought to determine the usage of communication channels including 'Video on' (enabling subjects to see gestures and make eye contact), 'Drawing Surface on' (enabling subjects to share drawings) and 'Audio on' (enabling subjects to hear each other). In this way particular hypotheses could be generated and tested regarding the nature of computer supported communication.

The ROCOCO project identified a great number of hypotheses during the three years of the programme largely based on observation and experience. Pilot

experiments informed the conduct of the research. Attempting to test too many hypotheses requires vast amounts of analysis time. The ROCOCO project chose to video pairs of subjects undertaking their one hour shared design task and this video tape was converted into a transcript. Analysis of verbal communication and non-verbal communication gave rise to over 70 hypotheses.

### **The DaRC project : towards a Hybrid Strategy for Research**

DaRC is the acronym for Design and Remote Communication. The project continues the investigations of CSCW but more specifically seeks to investigate the wider issues of 'connectivity' for the industrial design community. In this way studies of drawing exist within the wider context of design communication. The project has received funding from Loughborough University and this has facilitated creating two computer workstations similar to those devised for the ROCOCO project.

Each DaRC workstation is based on an Apple Macintosh Quadra 950 and resembles a traditional tele-conferencing area. Subjects can see and hear each other and interact on written and drawn documents. The real innovation in this workstation lies in the application of 'connectivity' in its broadest sense. Designers can increase their effectiveness if they connect into sources of information which may exist some considerable distance from their machines. There are two distinct types of enabling facilities. Firstly, 'groupware' enables interaction between remote designers and hence the sharing of expertise and knowledge. Secondly, 'internet services' which enrich the interaction between the participants by facilitating access to other sources of information. Examples of the latter include Usenet News, Gopher, Wide Area Information Systems (WAIS) and file transfer. Studies already undertaken indicate that designers can benefit from such facilities but there has been very little work involving analysis of designers exploiting combinations of connectivity tools available. It is the combination of tools that increases the potential effectiveness of the interaction.

### **Considerations in Research Design**

Research strategies provide a limited picture of reality. The illuminative approach of the NSEAD project was deemed successful since it outlined a breadth of issues to do with drawing strategies and functions - many of which were not anticipated by the author. The findings took the form of speculations regarding the application or relative importance of certain graphic strategies. The ROCOCO project on the other hand was able to

offer hypotheses and say whether the experiments had supported such hypotheses or not. However, it is questionable whether all the independent variables were actually held constant throughout the experiments, or perhaps more importantly, whether they were all identified. It should be remembered that the two strategies are not mutually exclusive. They are complementary rather than competing and it would appear that graphic research demands that both are employed. Earlier research by the author indicates that drawing lacks a detailed and commonly agreed language of discourse. Words such as 'sketch' and 'rough' are ambiguous and any analysis of verbal or written evidence such as questionnaires must proceed with great care.

The present work by the author seeks to exploit experimental studies using observational techniques to supplement and inform the findings. Pilot experiments will allow alternative research approaches to be applied. The research will consist of pairs of professional designers each working at a computer workstation. They will be linked by audio, video and computer-based drawing and writing programmes - largely emulating the ROCOCO project. Methodological concerns include the intrusive effect of the researcher and the influence of experimental conditions on the nature of shared design activity. Non-directive interviews would now seem to have outgrown their usefulness. The DaRC project displays a clearer direction as a result of the earlier work and consequently a more experimental approach will be adopted. Questionnaires and/or interviewing of participants will be used as a check on the experimental findings. One objective of the work is to assist an understanding of the human-computer interface which is rapidly becoming part of a designers working environment. Issues of connectivity and drawing are particular aspects of this interface and without research there is a very real danger that future working environments will fail to acknowledge the human practices and preferences of traditional face to face contact.

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