A VIEW OF THE NATURE OF DESIGN RESEARCH

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My own approach to the question, "What is Design Research?" is closer to that of the lexicographer than to that of the mathematician. The lexicographer attempts to discover and record the meaning of words and phrases on the basis of the ways in which the words and phrases are actually used and meant by the community concerned. The mathematician, by contrast, is eager to define his terms, either for the occasion or in reference to some previous worker's definition. The advantage of reliance on usage rather than on definition is its flexibility in the circumstances of a young discipline, where neither the scope nor the vocabulary of the discipline has yet reached stability.

That is not to say that I do not find definitions useful on occasion. For example, when pressed, I am prepared to define Design, without the article and spelled with a big D, as 'the area of human experience, skill and understanding that reflects man's concern with the enhancement of order, utility, value and meaning in his habitat'. In this sense, Design is being distinguished from Science, spelled with a big S, and Humanities, spelled with a big H, as one of the broad areas of man's concerns. This is not one of the usages that you will find in the twelve-volume Oxford English Dictionary (OED), which nevertheless devotes three whole columns to 34 senses of the word 'design', a space ordinarily devoted to as many as 20 different words.

I am also prepared, when pressed perhaps even not quite so hard, to define 'design', still without the article but spelled with a small d as 'the combined embodiment of configuration, composition, structure, purpose, value and meaning in man-made things and systems'. You will not find this in the OED either, but it comes closer to the definitions which are there. This is the sense in which the word 'design' is used by most designers, critics and users.

I do not need to be pressed at all to define the word 'research', with or without a big R. For me, research is, 'systematic enquiry whose goal is knowledge of, or in, the area of human experience, skill and understanding that reflects man's concern with the enhancement of order, utility, value and meaning in his habitat'. Alternatively, it might become, 'Design Research is systematic enquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value and meaning in man-made things and systems'. The former seems to me to be impossibly broad. Who needs Arts, Philosophy, Science and Letters, when we have Design Research, in this sense?

The latter definition seems to be a better description of the matter which design researchers are actually investigating, but I am still uncomfortable with its vagueness of its focus. On the other hand, I feel that an alternative definition, 'Design Research is systematic enquiry into the nature of design activity', which is where Design Research began, is too narrow. It is in the light of all these considerations then my own approach to finding an answer to the question, "What is Design Research?" is to try to discover what design researchers actually do.

Design Research at the Royal College of Art

Since it is what I know best, let me begin by describing what the people in the Department of Design Research at the Royal College of Art (DRE/RA) actually do.

DRE/RA was founded, albeit under another name, in 1901. Before that, in the period since 1954, I had personally been primarily concerned with the study of things. More precisely, I had been wholly engaged in the design and/or critical appraisal of the configuration, composition, structure, purpose, value and meaning of man-made things, mainly consumer goods and engineering products. In other words, I was a designer and critic. From 1967, however, I also became concerned with design methods, that is, with trying to understand and to explain how designers, including myself, when arriving at a configuration for the thing or system we were concerned with. In 1980, when I went to teach at the Hochschule für Gestaltung at Ulm, I was exclusively concerned with design methods. In 1961, when I was teaching at the RA, I became the RA's first Design Researcher, and under my direction, we were intent on pursuing the study of design methods by putting design practice on a purely commercial basis, and by trying to observe and record how we managed to do it. I must admit that we were much more successful at doing it than explaining it. Two out of the 15 major projects carried out on a contract basis in DRE/RA in the 1960s resulted in commercially viable products, several of which are still in continuous production and sale at the time of writing. It is typical under these circumstances that the findings on design methods were widely criticised by other writers as being too mechanical and simplistic to be realistic or useful models of the design process. For our own part, we were finding that, since our operations were entirely funded by the profit, such as they were, of the contract work, it was difficult to find sufficient resources to do the academic side of the work properly.

From 1968, as a matter of policy, DRE/RA reduced its volume of commercial business in order to introduce more conventionally organised academic observations of designers engaged in real or simulated design activity. The academic side of the work was then funded by the Science Research Council and by charitable research funding agencies. This was the period in which DRE/RA became heavily involved in the development of computer aids to designing. It was also the period when we became considerably involved in architectural, as well as in engineering and industrial, design. The study of design methods tended to give way to the study of the principles for erecting and manipulating models of the things or systems being designed. These changes were only partly voluntary, however. The studies undertaken were subject to the considerable constraints which we had to resort to given the necessity, for instance to protect the financial bodies that what we were doing was commercially viable and academically respectable, respectively. The overall pattern of activity in the period 1968-78, as discernible in the complete list of titles of the projects set out in Appendix A, is therefore not a good indicator of what the staff of DRE/RA thought was the ideal scope for Design Research at that or any other time.
In 1978, in an effort to escape from such pressures, DD/RCA was converted into an ordinary postgraduate teaching department, housing 24 Master’s degree and PhD research students, most of them design professionals or academics in mid- or early-career stages in the department, then and now, was to develop the discipline of Design Research, and to teach its methods to students drawn from a variety of scientific, scholarly and design-orientated backgrounds. The pattern of activity discernible in the list of project titles is therefore a better indication of the workers’ preoccupations than from 1978 onwards.

**Indications from a title scan**

What does an inspection of this list tell us? The first thing one notices is that the study of various aspects of the cognitive processes of design activity forms the largest single class of studies, far outweighing studies of design procedure. Case studies in design activity remain prominent, constituting the second largest class of studies. Although these carry incidental information about the design procedures adopted there, they do not themselves constitute explicit studies of design procedure. Third in prominence are studies in the application of computer aids in design activity, predominantly in relation to architecture and planning but intended to relate to design activity generally. Fourth, and almost equally prominent, are studies in the implications of the other findings of Design Research for curriculum development and teaching methods at all levels of education from the primary school to universit"
The material very unevenly distributed through the literature of neighbouring disciplines. Appendix C is a paper produced for me by Dr. Sebastian Lera on the basis of such a search.

It is sometimes argued that a test of the existence of a distinctive discipline is the presence or an organised literature containing all the essential ideas in discipline such that a suitably qualified entrant to the discipline can master its content without depending on the literature of other disciplines. By this test, Design Research is not yet a distinctive discipline.

Presumably it is considerations of this kind that have persuaded the Design Research Society, who are involved in and collaborator with the United States of America to describe their organisation as the Design Methodology Group and to name their journal Design Methods and Theories. In the narrower compass of Design Methods, it is even easier to demonstrate the existence of an independent literature containing all the essential ideas. A way towards justifying it as a discipline, rather suspect that DDR/BCA would have been willing to have limited its activities to these methods, and to have rested its claim for disciplinary status on the body of knowledge on which it was built, if DDR/BCA had not also been involved with a larger movement generally referred to as the design education movement.

The design education movement in Britain, and indeed elsewhere, is concerned with the ways in which understanding and skill development is organised and taught in schools and colleges. Protagonists of design education argue that the conventional view of the school curriculum and of the range of disciplines comprising higher education leaves out of account important sectors of the range of man's concerns, and fails to recognise the existence of kinds of knowledge that are vital to everyday living. These happen to be the same concerns as those handled by the design professions, and happen to employ the same capacities for perceiving, knowing, feeling, judging and imagining that are the central skills of designing.

More important to the protagonists of design education in schools, however, is the observation that these concerns and these intellectual capacities are essential components in the development of every boy and girl in coping with the problem of life. For example, the capacity for constructing in the mind's eye a comprehensive image of some existing or projected product, system or event, and visualising or modifying that image in the light of various considerations, is a competence that is used little or nothing in education in literacy or numeracy. The skill of externalising that image through the use of models of various kinds is exercised to some extent in education through art, craft and so on. It is generally given scant regard, however, not only in secondary schools and academic departments of universities, but also surprisingly, in schools of architecture and engineering. The further arts of handling problems in their full complexity, of forming judgements on value data and of making decisions in the face of imperfect information are, for the most part, suppressed, rather than encouraged, by conventional attitudes to knowledge and education. Critics of this kind have been noisier for a long time, of course. There are, however, more numerous and more powerful lobbyists voicing them in Britain at the present time than ever before.

It was the weight of the involvement of DDR/BCA in this movement that led to the formation of DDR/BCA as a separate department committed to the study of design education as a component of all education.

Design Research and design-driven enquiry

The idea of Design as a broad area of man's concerns, comparable with Science and Humanities, seems to be defensible in pedagogic terms. The idea that there exists a design-driven mode of enquiry, comparable with but distinct from, the scientific and scholarly modes of enquiry seems to be defensible by the design methods literature.

The idea that there exists in man as an intellectual process, for the handling of ideas of configuration and structure independent of natural language and of scientific concept formation, which I call imaging or cognitive modelling, seems to be demonstrable in the literature of cognitive psychology. The idea that there exists a lexicon and syntax for the externalisation of cognitive models seems to link a lot of the work in design methods research.

Design, then, like science, is not so much a discipline as a range of disciplines united by a common intellectual approach, a common language system and a common procedure. Design, like science, is a way of looking at the world and imposing structure upon it. Design, then, can extend to any phenomenon to which we wish to pay design-driven attention, just as Science can extend to any phenomenon to which we wish to pay scientific attention. Design Research, on the other hand, is not equatable with scientific research. It is design-driven inquiry, not Design Research, that is equatable with scientific research. Design Research can, and does, employ the methods of scientific research and scholarly inquiry in its pursuits, as well as, more rarely, the methods of design-driven inquiry itself.

Whilst Design Research can, and does, employ the unifying characteristic of being systematic enquiry whose goal is knowledge of, or, in the area of human experience, skill and understanding that reflects man's concern with the enhancement of order, utility, value and meaning in his habitat, it is nevertheless even less reasonable to regard it as a single discipline than it is to regard scientific enquiry or literary scholarship as a single discipline. The sub-disciplines which go to make it up now no doubt continue to expand, divide and reform over time, in the way that science and scholarship have expanded, divided and reformed.

If one takes the lexicographer's approach and records the meaning of the term 'Design Research' on the basis of present usage, it is clear that there are already three or more basic usages established in the centre of the term. The word 'design' is used in ways in which it is used in the following ways:

1. Design Phenomenology, in which I would include, for the time being, design history, taxony and technology, as I described them earlier;
2. Design Praxiology, in which I would include design modelling and metology; and
3. Design Philosophy, in which I would include design axiology, epistemology and pedagogy.

There are overlaps between these sub-disciplines, of course. All of them, however, although it is at present unclearly dependent upon external disciplines, are capable of expression as coherent bodies of knowledge with credible boundaries and specific fields of application. At a time when more and more bibliographies are being converted to computer-based databases with unlikely titles, and when more and more academic and professional literature searches are becoming restricted to them, the establishment of recognisable markers for the centres of interest in Design Research is a matter of some importance.

END
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APPENDIX A: LIST OF STUDIES CARRIED OUT AT THE DEPARTMENT OF DESIGN RESEARCH, ROYAL COLLEGE OF ART

Function and design of non-surgical equipment, Bruce Archer, 1962.
Operating theatre pedal bin, Kenneth Agnew, 1966.
Suspended ward equipment, Kenneth Agnew, 1968.
Hospital equipment survey, Gillian Patterson, 1966.
Safety in machinery design, Anthony Smallhorn, 1966.
Window design, Michel La Rue, 1968.
Centralising information on equipment for the disabled, Gillian Patterson, 1966.
Suitability of industrialised building systems to conditions in Mexico, Elisabeth Garcia, 1967.
Bath and bathroom design, Kenneth Claxton, 1967.
Application of steel in components for industrialised housing, Patrick Purcell, 1968.
Wheelchair design, Kenneth Sadler, Alan Bramson, 1968.
Computer-aided design of window-wall systems, Patrick Purcell, 1968.
Apparatus for the rapid analysis of fresh concrete, Karl Achim Czempor, 1969.
Role of design in educational technology, Richard Langdon, 1970.

Feasibility study for a computer-aided architectural design system, Andrew Garnett, 1970.
The coding of push-button controls, John Oates, 1970.
Computer-aided design and the evaluation of the building envelope, Patrick Purcell, Andrew Garnett, 1970.
Study of the equipment of hospital bed spaces, Richard Langdon, Gillian Patterson, 1972.
Ergonomic study for the design of sanitary fittings, Kenneth Agnew, Timothy Coward, 1972.
Analysis of the architectural design activity in the working environment, Patrick Purcell, George Hallen, Pierre Cousin, 1973.
Link system and other programs; a study of a computer network system as a means of communication and exchange, Robert Wadding Leigh, 1973.
Feasibility of evaluating the performance of a hospital building constructed in the UDHNESS system, Bruce Archer, 1974.
Feasibility study for the extension of the mausoleum on wheels scheme, Kenneth Agnew, 1974.


A contribution to curriculum development in design education (with special reference to the case of Chile), Alfonso Goméz-Morales, 1975.

The development of a compact hygiene unit for the disabled and able-bodied, Janet Hall, 1975.

Study and design of kitchen systems for disabled unit, James K. O'Grady, 1975.


The requirements of emergency shelter equipment for use in large scale disasters, Kenneth Agnew, Gillian Patterson, 1976.

Towards the development of a model of the architectural design activity (with indications for the design activity in general), Christopher Cunliffe, 1976.

The development of interactive graphic aids for design problem structuring, George Mallen, 1977.

The requirements of DIY tools for use with steel domestic building components, Kenneth Agnew, Gillian Patterson, 1977.


Computer aids in the design process towards the development of computer aided equipment design, Craig Johnson, 1977.


A contribution to the understanding of designer/computer interaction in the early stages of design problems, Brian Beflin Smith, 1977.

Production design and control, Mary Scott, 1977.


Towards a design model for low income housing in developing countries, Neela Perera, 1978.

A contribution towards a methodology by which design skill may be studied, William Robertson, 1978.


Environmental education, computer modelling and the participant citizen, Mary Simmons, 1978.

An investigation of user responses to a prototype audio teleconference system with applications for the design of teleconference systems, Frank Stone, 1978.

A psychological approach to the problems of aids and equipment for the physically handicapped, Fiona Taylor, 1978.


The design and development of the game FA.CE, Tina Rees, 1979.

An investigation into the design activity in children with particular attention to its problem solving aspects, Rosalyn Payne, 1979.

Microprocessor application: some implications for industrial design, Alec Robertson, 1979.

Transition - user participation in the design of housing, Bruce Bentz, 1980.

An investigation of the thermal benefit of an attached greenhouse and energy consumption in terrace housing, Brian Ford, 1980.

An exercise in the utilisation of inexpensive computing power in the design of medical diagnostic equipment, Jonathan Lippold, 1980.

Socio-economic aspects of industrial design: a contribution to the development of research in this area at the National Autonomous University of Mexico (UNAM), Jose Manuel Lopez, 1980.

A study of possible contributions from psychology to industrial design curriculum (with special reference to the National Autonomous University of Mexico), Maria Isabel Suarez, 1980.

Some methodological considerations for the empirical study of design and design activity, Wil Wilson 1980.

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APPENDIX B: STUDIES CONDUCTED IN THE DEPARTMENTS OF CULTURAL HISTORY, DESIGN EDUCAITON AND GRAPHIC INFORMATION, ROYAL COLLEGE OF ART

Cultural History

In quest of reality: Art and indigeneity in post-colonial cultures, with special reference to contemporary Indian culture, Geeta Kapur, 1970.


The background and development of the basic design concept, Nuri Tuncayol, 1971.


The character of contemporary art education: A sociological perspective, Andrew Devaney, 1972.

Aspects of the work of Dr Christopher Gossen 1524-1604, Stuart Durant, 1972.


The Pre-Raphaelite Brotherhood 1848-1853, Roger Smith, 1972.


Non-linear information in linear media by passing the master and apprentice education, Tom Graves, 1974.


Edward Taylor and the Birmingham School of Art, 1974.


Pop Culture since 1946 in Britain, Christopher Williams, 1974.


An attempt to establish the effects of teaching art history in British art schools since 1948, Wayne Mercer, 1975.

To analyze the various concepts which went towards defining the term artist in the late nineteenth century, Andrew Morton, 1975.

To Gather Information Concerning the Building of Gothic Cathedrals which would be of some use to the Restoration Programs at present in Operation and for those in the future, Nicholas Woodward-Smith, 1976.


A comparison between the frequency of appearances between wood-engravings and half-tone illustrations in the popular press 1880-1890, Leo de Freitas, 1976.

Women's magazines in Britain, 1900-1976, Anthea Hinds, 1976.


A critical history and appreciation of beadwork and decorated houses of the Sothe and Xhosa tribes of South Africa, Miranda Harris, 1977.

An historical survey and interpretative analysis of the photographic work of the Army Film and Photographic Unit in the period of the Second World War, Laurence Hayward, 1977.


The Vorticist movement, 1914-18, Andrew Wicks, 1977.


Late 18th and early 19th century textile and wallpaper designs by Lewis P. Day and other designers associated with the Arts and Crafts Exhibitions Society, Elizabeth Mycroft, 1978.

The problematic nature of photographic realism: an investigation into the work of Albert Renger-Patzsch, Brian Stokoe, 1978.


Narrative Analysis and the Westerns, Ian Green, 1979.


Living Space: some psychological implications of the design of urban environment, Mary Thomas, 1979.

Contemporary attitudes to the way drawing is taught in Schools of Art, Rose Nylle, 1979.
A study of the relations between design activity and moral awareness in secondary education, Trisha Burgess, 1981.

Craft values in design education, Anthony Howard, 1981.

Reports


Design in General Education, Professor Bruce Archer, Ken Baynes and Richard Langdon, 1976-79.


Graphic Information

The relative effectiveness of ten alternative systems of typographic coding in bibliographic material, Herbert Spencer, Linda Reynolds and Brian Coe, 1973.


The effects of image degradation and background 'noise' on the legibility of text and numerals in four different typefaces, Herbert Spencer, Linda Reynolds and Brian Coe, 1975, revised 1977.

Factors affecting the acceptability of microforms as a reading medium, Herbert Spencer, Linda Reynolds and Brian Coe, 1977.

The effects of show-through on the legibility of printed text, Herbert Spencer, Linda Reynolds and Brian Coe, 1977.

The effects of different kinds and intensities of background 'noise' on the legibility of printed text and numerals, Herbert Spencer, Linda Reynolds and Brian Coe, 1977.


Two experiments on the layout of information on Computer Output Microfilm, Linda Reynolds and Herbert Spencer, 1979.


A VIEW OF THE NATURE OF DESIGN RESEARCH

APPENDIX C: THE DEVELOPMENT OF A BIBLIOGRAPHY FOR DESIGN RESEARCH

by Dr Sebastian C. Lara

I have undertaken a survey of the various sources in which publications about design research are cited. The sources are of two kinds: bibliographies and abstracts indexes. My original intention had been to quantify the number of publications in the field by delineating boundaries in some way. However, I describe my findings and then to discuss the question of quantification. I shall confine myself mostly to recent publications in English, during the last ten years.

Abstracts Indexes

1. The Architectural Periodicals Index is published by the RIBA. It dates from August 1972. Over 300 periodicals are covered from 'Architectural Association Quarterly' to 'World Hospitals', including 'Computer Aided Design', 'Design', 'Design Methods & Theories', 'Design Quarterly' and 'Research and Design'. A proportion of periodicals included are not in English - about one third of the articles listed. Nevertheless, emphasis is on Great Britain. Negotiations are in progress to computerise the index. The fields covered are architecture and allied arts, constructional technology, landscape, planning and relevant research. In all these fields, articles on both current practice and historical aspects are included. In planning the stress is on actual schemes, conservation and urban history, rather than pure theory and research. About 10,000 articles/papers, are indexed per year.

2. Psychological Abstracts cover these areas of research design. First, architectural/environmental psychology; human behaviour in relation to designed environments; second, human factors engineering (ergonomics) material. In the first category, they index abstracts from 'Environment and Psychology' and 'Nonverbal Behaviour' in the second. In 1970 there were about 30 papers listed in the first category and in the second about 20.


An interesting literature review was provided by Stokols, D. 1978, 'Environmental Psychology', Annual Review of Psychology, vol. 29, 245-285. He writes: 'The research literature on human behaviour in relation to its environmental setting continues to expand at a staggering rate. The rapid expansion of environmental psychology can be gauged by the diversity and sheer quantity of publications that have appeared since 1972. From early 1972 to early 1977 there were 10 text books, 6 edited readers, multiple volume volumes on specific topics, etc. Were published. Environmental psychologists have maintained a vigorous level of professional and interdisciplinary contact as evidenced by annual ENRA (Environmental Design Research Association) Conferences and Architectural Psychology Conferences.'

Two journals existing are 'Environment and Behaviour' and 'Environmental Psychology and Nonverbal Behaviour', and there are some other newsletters, etc.

In all, he lists some 500 items of interest to environmental psychologists, only some of which, however, would seem to relate directly to design research. Those about population, for example, seem rather remote.


3 Ergonomics Abstracts. This is a selection of some 3,000 abstracts (in English) annually by the Ergonomics Information Analysis Centre, University of Birmingham. There appears to be a close correspondence of psychological Abstracts, Raynal, K., et al. Much of the section entitled 'The Design of the Man-Machine Interface' is relevant to design research, for example, subsections on Visual Displays, Controls, Workspace Layout, and Equipment design. In 1979 about 400 items were included in these subsections.

4 BIBRA, International Repertory of the Literature of Art, provides some 10,000 entries per year in visual arts. It has now become available on-line at the Courtauld Institute. It includes architecture, sculpture, decorative Arts, and Decorative Arts. I am told that there is little overlap with the Architectural Periodicals Index. The word 'design' produced 1,660 citations, 'Industrial' 430, 'products' 55, 'research' 500, 'graphic' 8,000. There was just one citation for 'consumer product', Herman, L. R. Brand, L. F. M., the designs of Raymond Loewy, Exhibition catalogue, Whitney Gallery, Smithsonian Institute, Washington DC.

5 Design Abstracts International, is published by the International Council for Societies of Industrial Design (ICSID). They refered some 2,800 items between 1972 and the end of 1978, covering abstracts from about 60 journals. These include Architectural Association Quarterly, Architectural Design, Design (UK), Designer (UK), Industrial Design (USA), New Products and Processes (USA). However, there are many more in languages other than English; I estimate only about 10% of the material to be in English. Classification headings are: Design, Product and Industrial Design, Visual Communications, Graphic Design, Architecture, Space and Planning, Urban Planning.

If I may venture a personal opinion, I believe this to be a poor bibliography. I believed that the inclusion of a handful of say, Architectural Periodicals out of the dozens (hundreds?) available, and of one town planning journal, seems curious. Who would want to consult this for architectural or town planning material in view of such selectivity? And they are not journals which have material of relevance to, say, industrial design. Conversely, to miss out, say, Design Methods and Theories in an abstract order about seems a sad omission, let alone omitting the weight of relevant material in ergonomics and human factors, to name but a fraction.

Bibliographies

1. Wittkowsky Almanac (1980) in a section on books published in Great Britain (taken from 'The Bookseller') gives the numbers of books published in 1976 on architecture as 368, on Art as 3,304. There is no listing for 'Design'.

2. Art Books: 1976/1977, 1979. New York: R. H. Bowker Company. A total of 37,000 books are indexed, all in English. Under the sections Design, Design Industry, etc., there are about 200 books. For example, Design London: Design Council. Of course, there is much for design research under headings of various artifacts, clocks, watches, etc., and much else about art, painting, etc.

3. Bibliographic Guide to Art and Architecture published annually by G. W. Hall, Boston, Massachusetts. Latest edition 1979. Includes Painting; Print Media, Decorative Applied Arts; Visual Arts; Architecture; Sculpture; Drawing and Illustration. Fully international. Includes exhibition catalogues, etc. 1979

Of course, there is much for design research under headings of various artifacts and much else about art, painting, etc.


5. Coulson, A. A. A Bibliography of Design in Britain 1851-1970. London: Design Council. Contains some 8,000 references. Under the heading 'Design and Designers' are sections on theories of design and craftsmanship; evolution of design; general chronological studies; periods and tendencies; important designers; Europe and elsewhere; colour, ornament and pattern; technical, social and economic factors. Under 'Arms of Design Activity' are sections on graphic and print design; interior design; furniture design; designing in particular materials; costume and fashion; appliances and mechanical equipment; transport.

Discussion

I am well aware that the foregoing account omits many important areas of design, or at least deals with them perfunctorily. Transport design, for example, is covered by Coulson's bibliography, but he is aware that he includes only a fraction of the material available; he suggested to me that multiplying his list by six would give an idea of what else is available.

Leaving aside these omissions, here are two extreme examples for design research bibliographies, and crude attempts to quantify the material available:

Example One. There is an area of academic study which might be said to form a kind of central core of design research. Within this boundary would lie methods, design theory, design history, design education, some of the computer-aided design and ergonomics literature and perhaps environmental psychology, architectural theory and architectural history. Very roughly, one might estimate the annual number of publications in these subjects as follows: design methods and theories, say, 100; design history, say, 100; design education, say, 50; relevant CAD, say, 50; relevant ergonomics, 400; environmental psychology, 50. Leaving aside architectural material, this totals some 750 publications per year.

Example Two. In total contrast to Example One, it seems highly desirable to have a database on all designed artifacts from city plans to door knobs, from space rockets to balloons and encompassing human factors and psychological responses. Some idea of the number of publications per year could be obtained as follows:

Architectural Periodicals Index 19,000
Environmental Psychology 50
Ergonomics 400
RAH, say, half that available 2,000
Transport and engineering (a pure guess) 5,000
Total of periodicals citations about 20,000
Books, see bibliography section say, 2,000

This extremely rough method gives a total of some 22,000 publications per year in the field of design.